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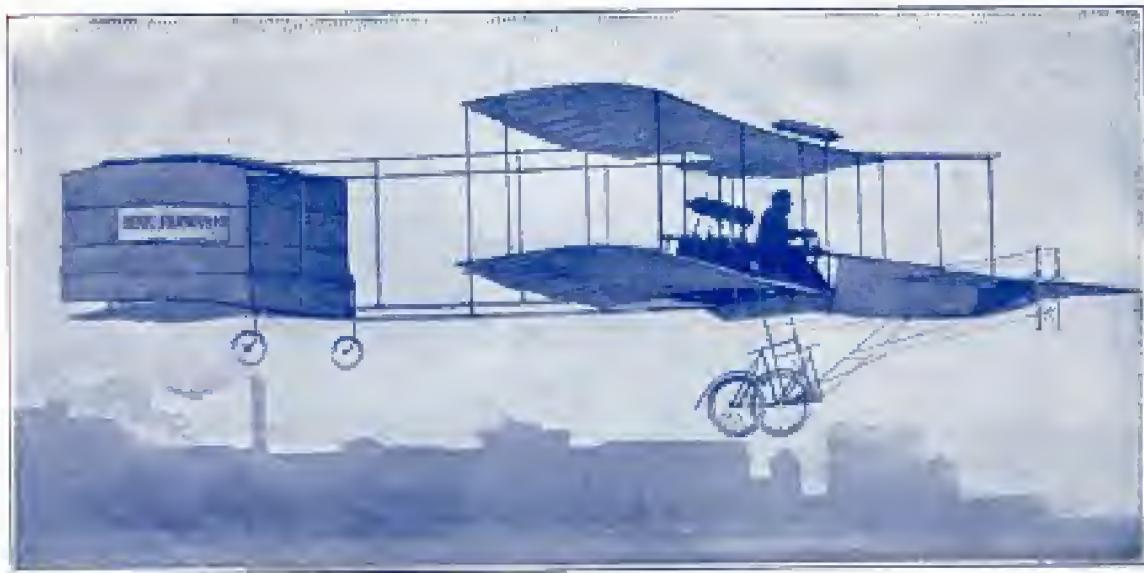
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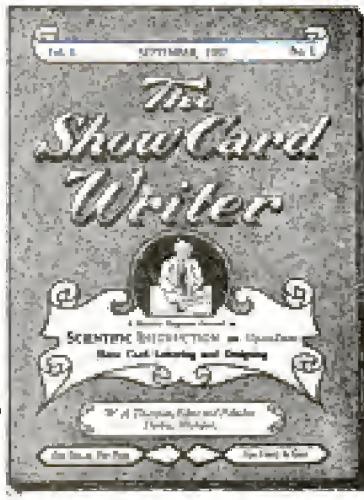
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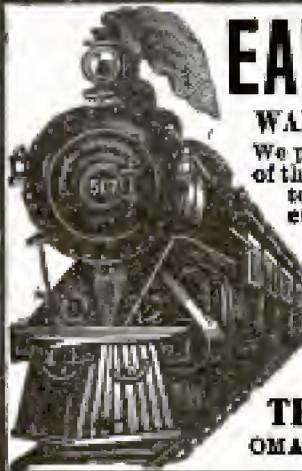
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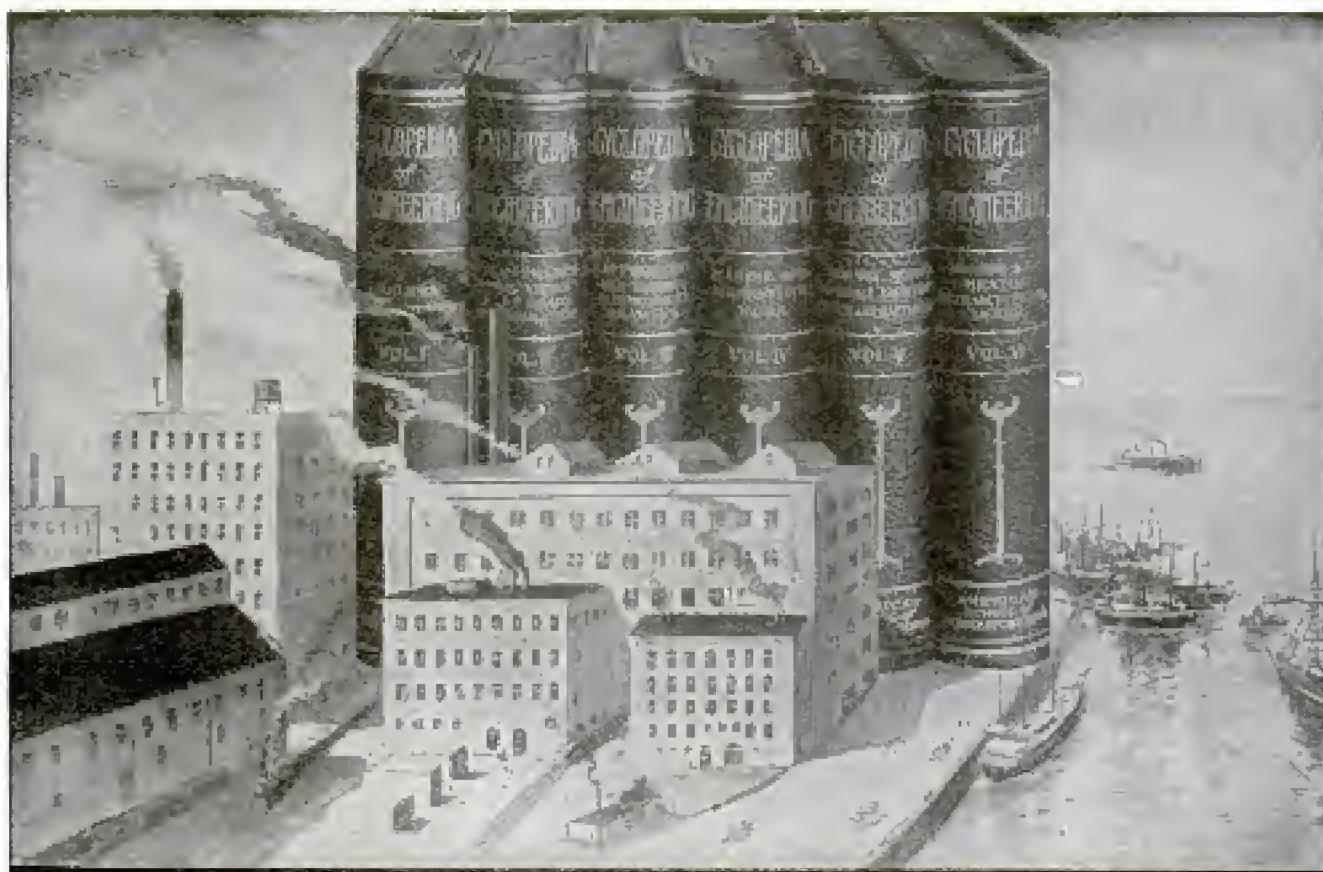
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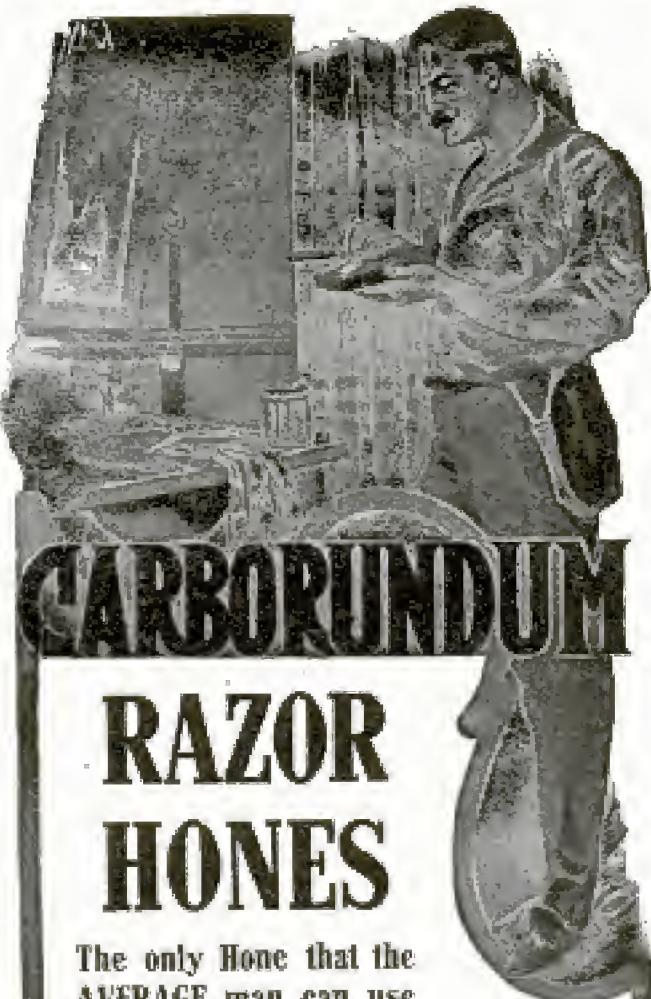
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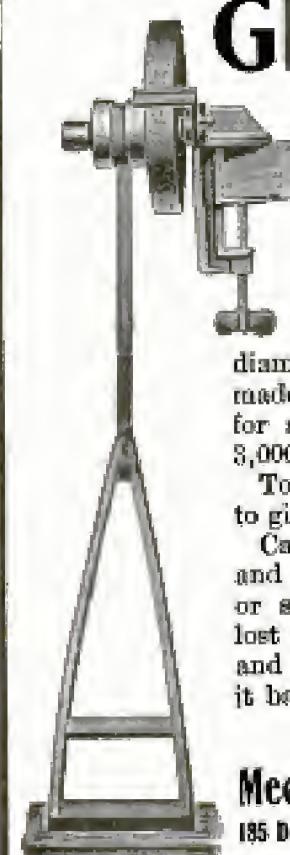
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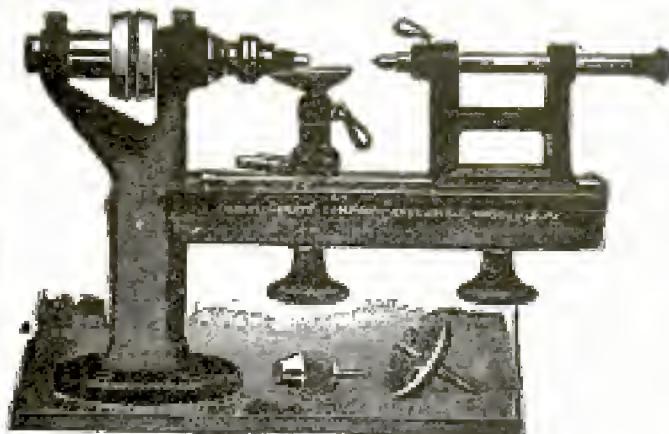
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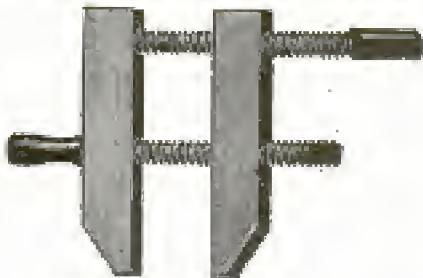


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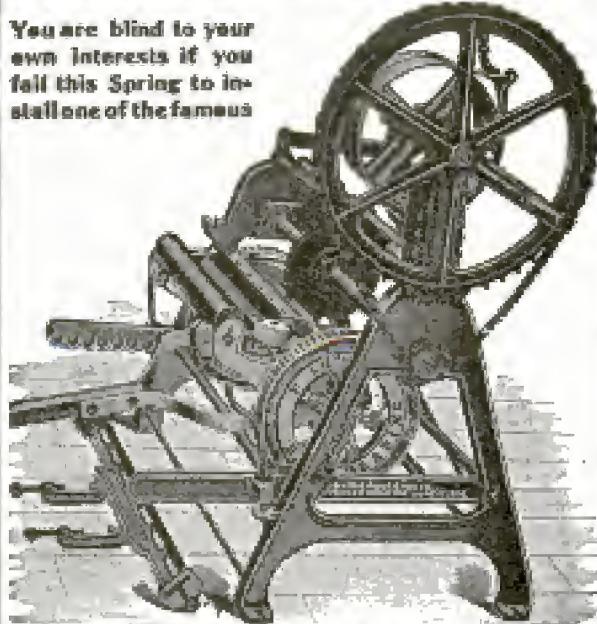
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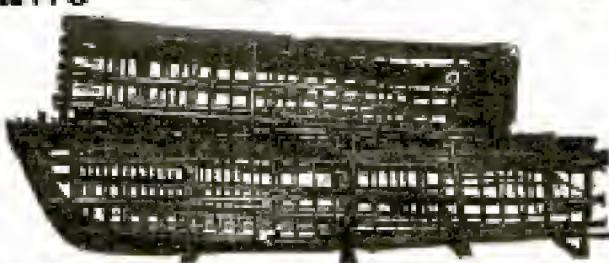
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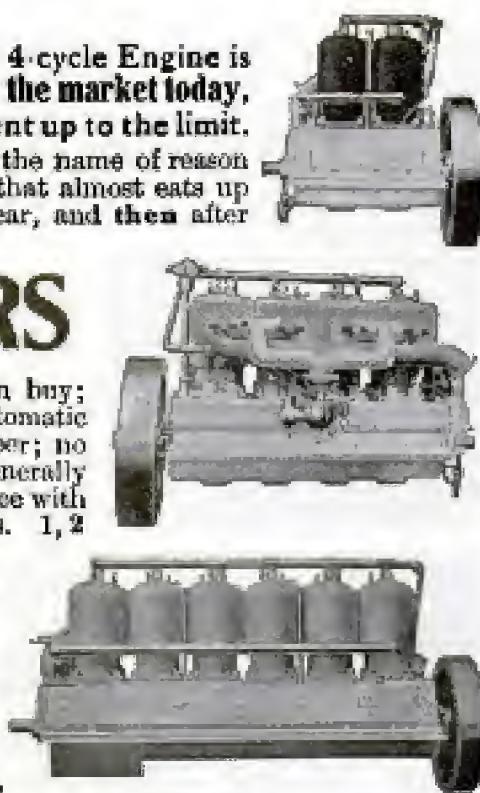
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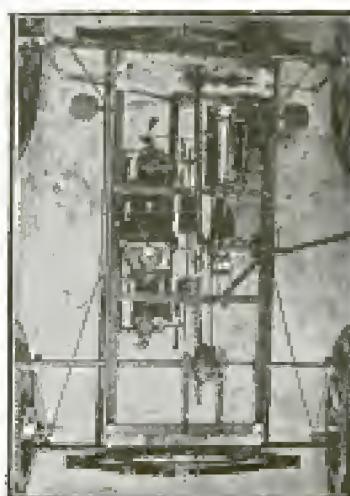
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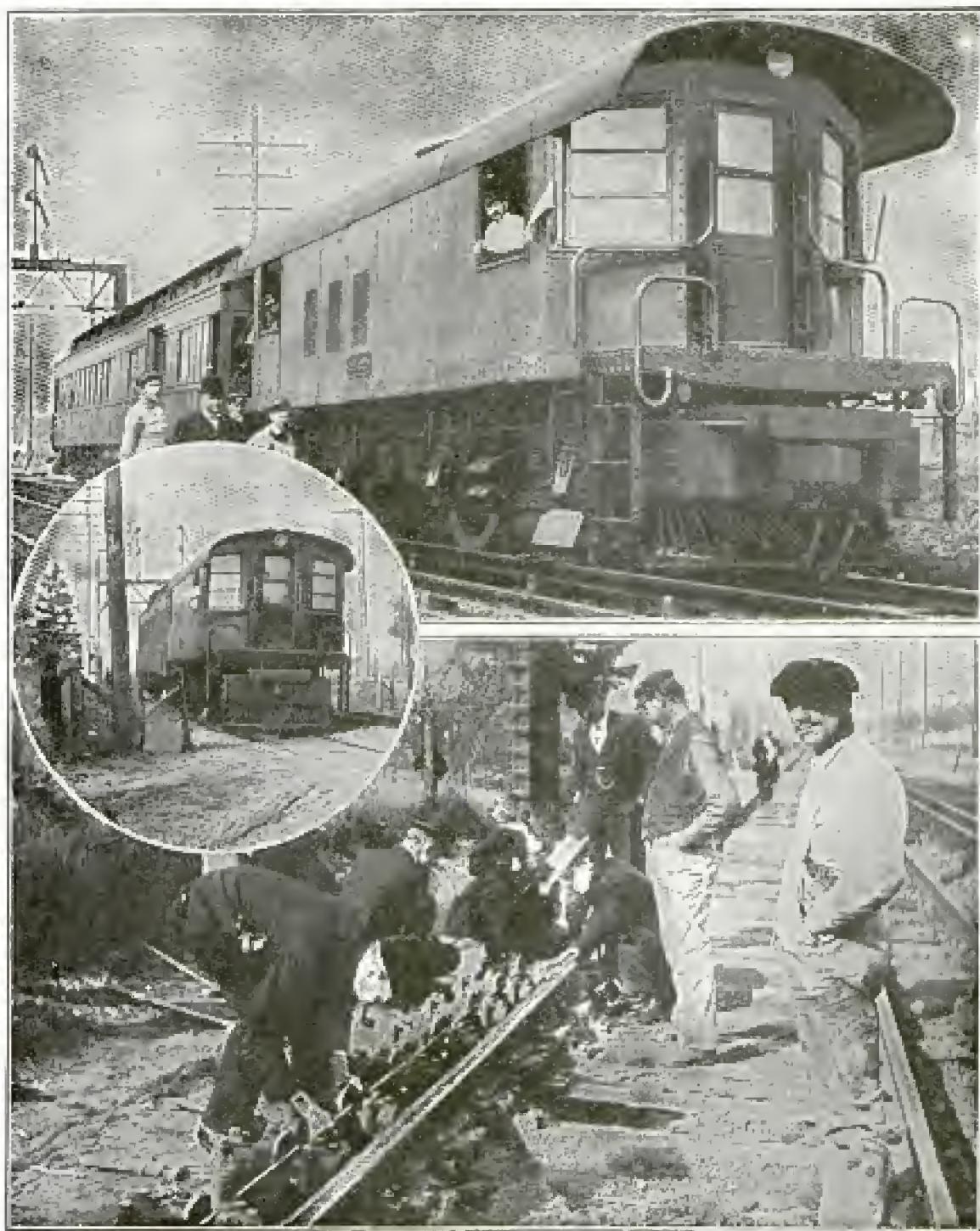
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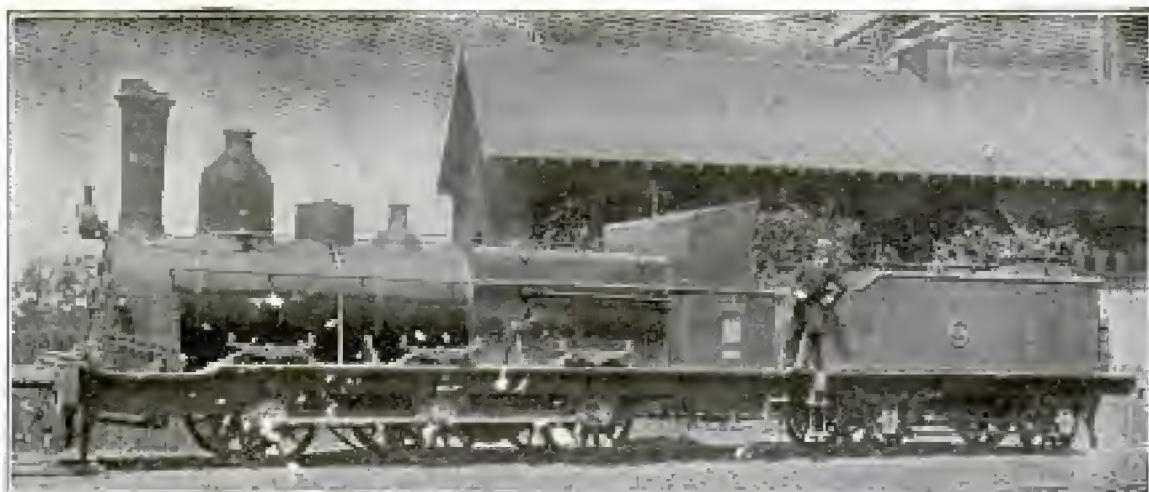
Vol. 10.

MARCH, 1908.

No. 3.



Seeking the Speed Limit of Safety (See Page 240)



Curious Freight Locomotive on the Belgian State Railways

SEEKING THE SPEED LIMIT OF SAFETY

Electric Locomotives in Tests Develop Speed of Over 90 Miles an Hour

Special Devices Register the Strain on Rails

There was a time when, a new stretch of railway line having been completed, the engineers of the road ordered a train crew to run a train over it at full speed, with the idea that if no accidents occurred the track had been sufficiently tested and found safe. Such a time has passed. New devices have come into use which make it possible to determine to the very letter the amount of strain to which a piece of track can be subjected.

For several months the Pennsylvania railroad has been conducting a series of tests along its lines to determine the relative safety of highest speed with steam and electric locomotives.

To carry out these tests a half mile of track was built through a rural section. The half mile of track has a sharp curve in the center and lies on a stretch of almost perfectly level ground. Over this, hundreds of runs have been made with three powerful electric locomotives and some of the largest steam engines the road owns. Speeds of from 90 to 96 miles an hour, timed by accurate electrical apparatus, have been made.

To enable the locomotives to attain a high speed the runs commence on the main line several miles distant from the special track. For the half-mile stretch, steel beams support the rails, and at the outer ends, which are a trifle higher at the curve, are delicate gauges which measure the impact of the heavy locomotives as they pass over it. The gauge consists of a vise through which a plunger runs. One end of the plunger rests against the upper edge of the rail and the other end is bored out until a cup 5 in. in diameter is made. In this cup is placed a polished steel ball of the hardest tempered steel. Within the vise is placed a strip of boiler plate 3 in. wide and 14 in. long. One side is highly polished and marked off by rectangular lines about 1½ in. apart. This plate is so adjusted that the ball in the cup-shaped chamber in the end of the plunger rests against the polished surface of the plate at the point where the lines cross. As the locomotives pass over the track the arrangement of the gauges brings all the outward and downward pressure to bear upon the plungers. This pressure is transferred by the

steel balls to the polished surface of the plates, upon which it makes indentations. It is upon the comparative diameter and depth of these indentations that the experts figure the pressure on the rails. Seismographs mounted in the locomotives measure the degree of sway in rounding the curve.

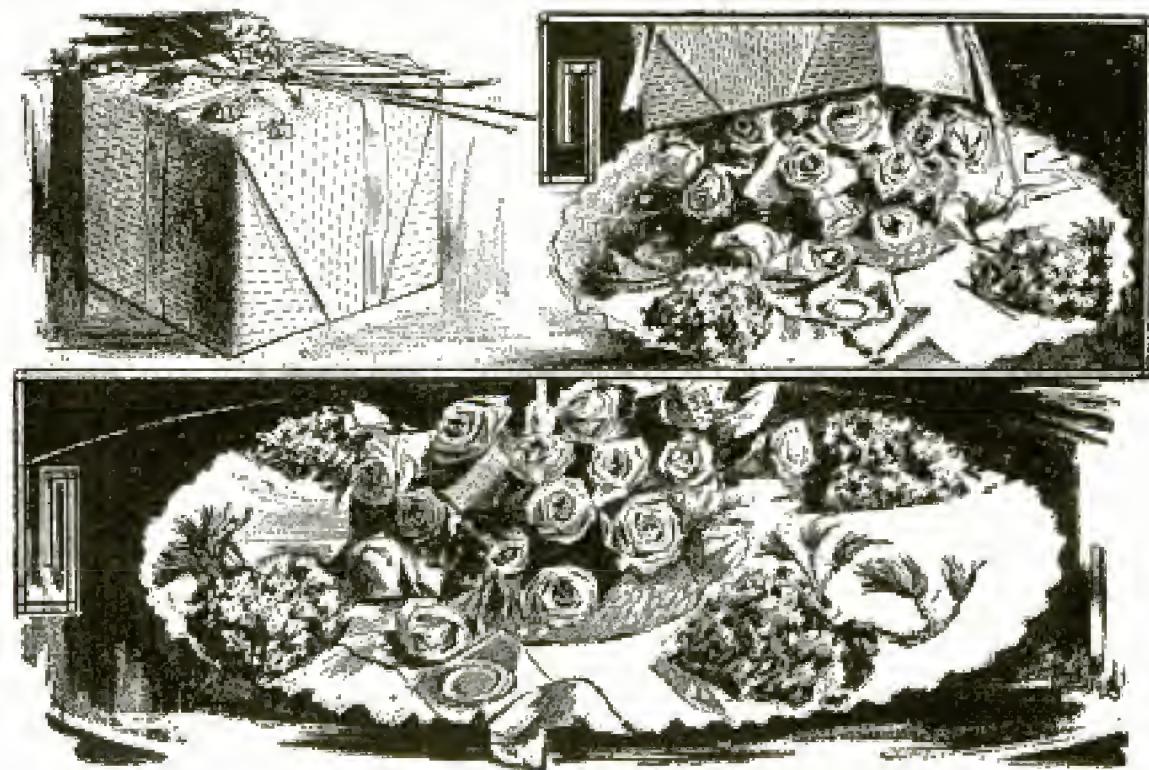
The electric engines used in the tests weigh 95 tons and are each equipped with four 500-hp. motors. In reality the engines are each just one-half of the complete locomotives which will be used to draw trains through the Pennsylvania tunnels now under construction beneath New York city. It was considered too hazardous to use the complete engines in the tests because of their great weight. Only on one occasion was the experiment tried of coupling two of the locomotives together, and then the weight and speed drew the spikes from the tracks as the wheels passed with a racket like the clatter of a gatling gun.

FLOWER-BOX NOVELTY IS ARTISTIC

One of the most unique as well as artistic arrangements ever conceived as a novelty creation for the presentation of flowers is the surprise gift box shown in these illustrations. At first sight the box might contain only bonbons, with a few flowers passed through the ribbon tied around it. The moment the ribbon is untied, however, and the cover of the box is lifted, the sides fall perfectly into the shape of a centerpiece, and a beautiful bouquet of roses, surrounded by bunches of violets, greets the eyes of the recipient of

the gift, says Florists' Review. The ground work on which the flowers are arranged is a point-lace doily.

In Colombia, South America, half the miners are women. In hydraulic mining they work up to their waists in water side by side with the men. In fact, if the women did not do this work the gold fields of Colombia would to a great extent be undeveloped. The wage paid ranges from 15 to 25 cents per day.



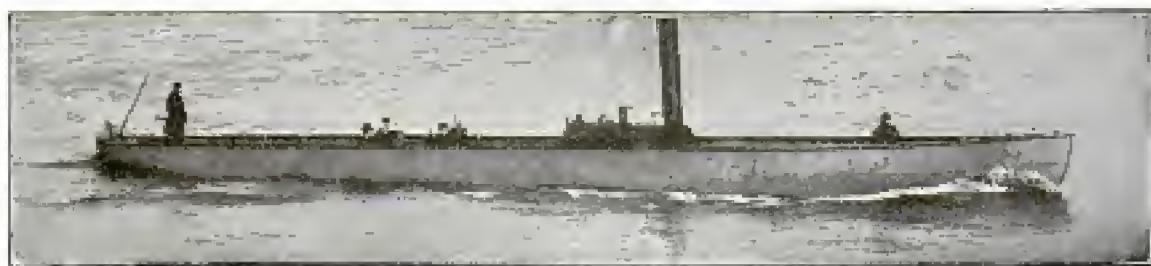


Shooting an Oil Well at Chanute, Kan.

REMARKABLE SHALLOW-DRAFT CRAFT

For the navigation of lakes and streams where the depth is only one or two feet, launches, although of comparatively large size, must be constructed on the most shallow lines.

This steam launch, which is one of an English type of shallow-draft launches, is 75 ft. long and has a beam of 9 ft.

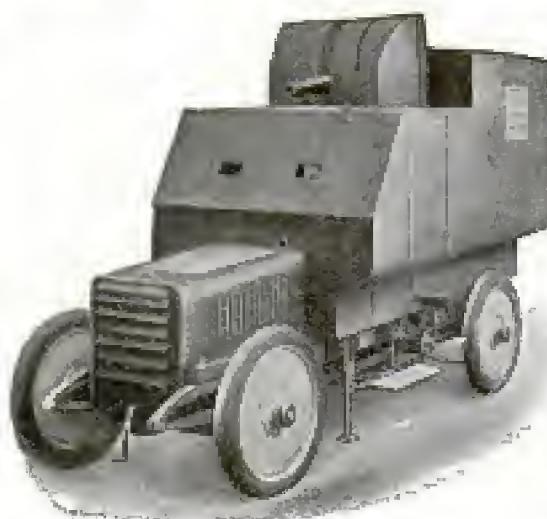


English Shallow-Draft Boat

3 in. Running at a speed of 10 miles an hour, with only a light load, the boat only draws 11 in. of water. With a load of 10 tons, at the same speed, she draws 20 in.

GERMAN FIGHTING AUTOMOBILE

This armored fighting machine is the latest type of rapid-firing automobile in the German military service. It is armored with nickel steel plates heavy enough to withstand infantry shots or shrapnel at 1,000 ft. The machine carries 5 men, 100 lb. of ammunition and one gun, which is capable of shooting a distance of 22,000 ft. The



Rapid-Fire Gun Auto

weight of the automobile is 7,000 lb. and its speed from 30 to 45 miles an hour.

The 130 miles of street railways in St. Petersburg are all to be equipped with electricity within the next six years.

THE CAUSES OF MINE DISASTERS

Deadly Gases Lie in Wait for Miners—Perfect Ventilation and Continual Watchfulness Necessary—Carelessness and Greed of the Ignorant a Menace—22,000 Killed in 17 Years

By Francis M. Buzzell

Many stories have been written about a lump of coal, in which the reader has followed its travels from the moment the miner struck his pick into the

task of wresting it from the earth to make warmth or steam for mankind. If it were really animate, how many stories it might tell of disaster, in



Courtesy The Black Diamond

Entrance to No. 8 Shortly After the Explosion

seam it was part of, many hundreds of feet underground, and in the author's fancy it became animate, until after many experiences it at last found itself in a scuttle before a fireplace or stove in some quiet, peaceful home, far distant from the depths where its first knowledge of life was strife, misery and death.

Few people stop to think when they toss a lump of coal into the fire how many lives may have been lost in the

which it saw strong men, hopelessly struggling and praying for a breath of fresh air, die in agony in the deep, dark holes under ground.

From the year 1890 to the close of 1906, 22,840 men met such a death in the coal mines of the United States. Not since 1897 has the annual list numbered less than 1,000, and each year the number has grown larger. In 1906 the fatalities were 2,061, and 1907, when the figures are all in and

compiled, will number more than that. Notwithstanding the added precautions taken and the new safety devices installed, the climax came when, in the



One of the Chambers

course of but 19 days, 759 men were killed in four awful disasters which have appalled the entire country.

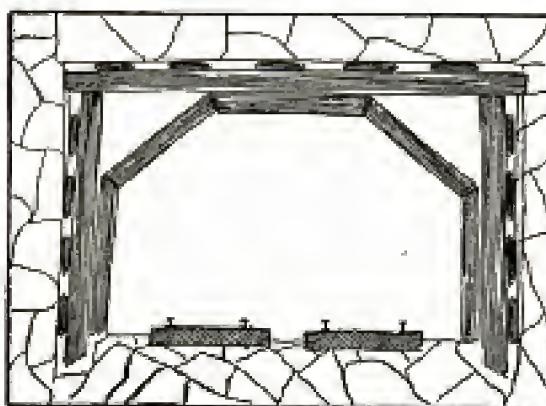
The first of these was in the Naomi mine, Monongahela, Pa., 30 killed; the second, Monongah, W. Va., 398 killed; the third, Yolande, Ala., 81 killed; the fourth, Jacobs Creek, Pa., 250 killed.

All four disasters were caused by the explosion of fire-damp and coal dust, but the causes of the explosions themselves are not known, nor what atmospheric conditions, in or out of the mines, caused them to occur when they did. All that the best mining experts in the country have been able to do is to state their beliefs. When all is said and done the fact remains that some of the best-equipped and best-managed mines in the country have been the

ones to suffer disaster, and experience seems unable to cope with the conditions noted.

Some of the experts who made investigations believe the explosions were partly due to climatic conditions. They remark that the catastrophes occurred at about the same hour in the day, in a zone of certain altitude, in about the same longitude and under other similar conditions. They suggest, therefore, that if the air forced into the mines by fans were gathered from a higher point and treated to remove impurities, the accidents would be less numerous.

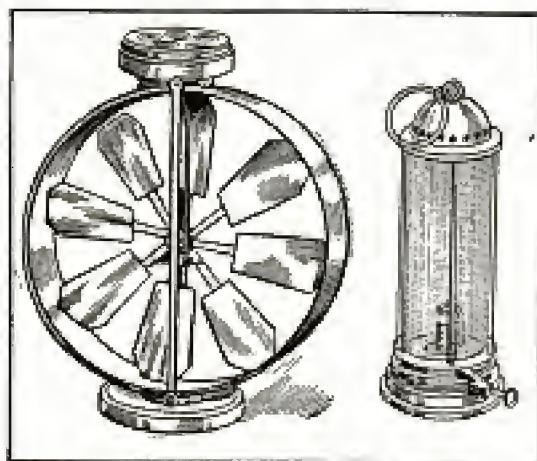
In all the mining districts of the British Isles this important factor in the protection of the men, who seldom see the sunshine, is given more serious consideration than in most countries. Reports are issued every day, as weath-



A Main Entry

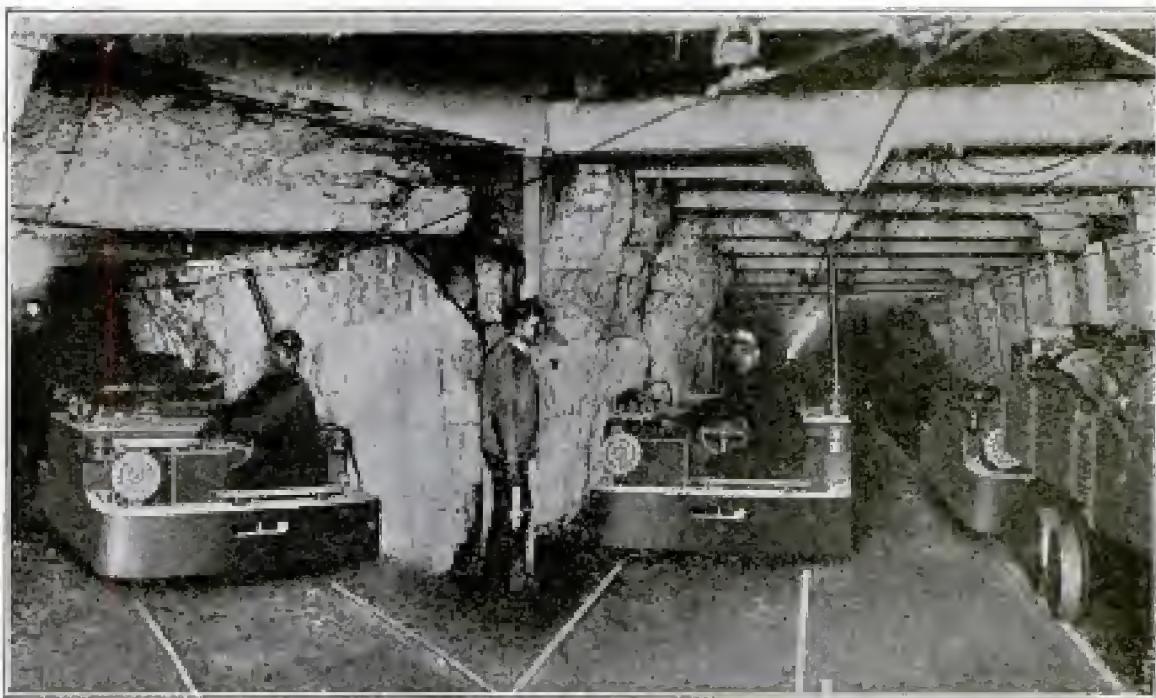
er reports are issued by the U. S. Weather Bureau, warning mine superintendents of sudden atmospheric changes and advising what cautions should be taken to meet such conditions successfully. These reports are published daily in every English newspaper having a circulation in the mining districts.

This brings us to the subject of ventilation and the different death-dealing mine gases. To obtain proper circulation through the mine one shaft must be constructed by which the warmer and lighter air can ascend while the cold air rushes down another shaft to take its place. The ventilation must also be so arranged that as many independent ventilation districts as pos-



Air Meter

Safety Lamp



Courtesy Jeffrey Co.

Electric Mine Locomotives

sible be provided with separated air-currents. Especially must each "lift" of workings, which is the term for all mine workings connected with, opened from and mined out at one level, be supplied by the shortest way with the necessary quantity of fresh air. This is in part accomplished by building doors or hanging heavy canvas curtains across the levels at intersections to turn the currents of air toward the direction desired. Within the separate "lifts" of workings the air-current must always be ascending, except in cases in which the descending currents are not used for further ventilation purposes.

The four dangerous mine gases are light carburetted hydrogen gas, called fire-damp; carbonic acid gas, called choke or black-damp; carbonic oxide gas, called white-damp; and after-damp, the result of a mixture of air with the oxygen burned out by an explosion of fire-damp, and a little black-damp.

Fire-damp is the most dangerous. It issues from the pores of the coal and from seams in the surrounding strata. Sometimes it will burst forth from cavities in the rocks like steam under pressure, filling the excavations so quickly that the miners are suffocated

before they can get away from it. When pure, or nearly so, it is not explosive, but the moment it mixes with the air it renders the whole surrounding atmosphere so combustible that when it comes in contact with an open light an explosion is inevitable. This gas is only one-half the weight of air and seeks the higher levels. The principal object of modern ventilation is to remove this damp by air currents, or to so dilute it as to render it non-explosive. Experiments have proven that fire-damp and air just below the explosive point becomes explosive when suddenly compressed, as by the discharge of a heavy shot, a sudden and extensive fall, or a heavy explosion in adjacent workings. To this end in all European mining countries regulations have been made forbidding the use of such explosives as are known to be the most liable to ignite fire-damp, and limiting the amount used in any single charge.

The only safe and sure detector of fire-damp is the safety-lamp. The flame is surrounded with a sheet of iron-wire gauze having a mesh of 784 holes to the square inch. This is such a good absorber of heat that the flame in contact with it could not readily pass



Emergency Hospital—300 Ft. Underground

through and ignite the damp. The blue flame which burns in a safety-lamp the moment the atmosphere becomes filled with fire-damp warns the miner of its presence and the danger which threatens him.

Black-damp is detected by watching the flame of the lamp. When the air is filled with black-damp the light burns dimly, and will sometimes be nearly extinguished. This gas is produced by decaying organic matter, by the breathing of animals and men, and from the combustion of all substances containing carbon. It is dangerous to breathe air containing 8 per cent, and lights are extinguished at 10 per cent. Being $1\frac{1}{2}$ times the weight of air, it finds the lower levels and requires powerful currents to remove it. The reason of its injurious effects is the close affinity between the oxygen and the carbon, the lungs being unable to separate them. This is why the miners speak of it as choke-damp.

Now comes its one redeeming feature. The presence of one-seventh of this gas in an atmosphere of fire-damp

will render it non-explosive. This in mining language is called "damping the gas," and arguments have been advanced that if it were not for the black-damp present in the extensive waste of collieries, where falls of rock have made ventilation almost impossible, the whole of the abandoned workings would become a dangerous magazine of explosive mixture. Thus it is seen that black-damp is the lesser of the two evils where ventilation is impossible.

White-damp, caused by the combustion of wood or coal, is not often accountable for serious accidents, but when it does exist in large quantities it is the most dangerous of all mine gases as the cause of the kind of accidents which kill a few miners here and there, but do not extend to the entire workings. Very little experience is necessary to detect fire-damp with the safety-lamp, and black-damp quickly makes its presence known by quenching the light. But a miner might enter an atmosphere vitiated by white-damp and fall insensible before his lamp gave any indication of danger.



Mine Ambulance Car for Injured Miners

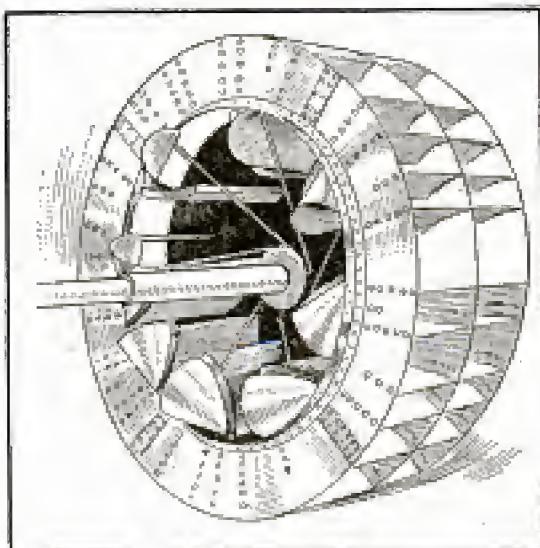
It is detected, by those who have had experience with it, by its peculiar sweet odor. Three per cent of it in the atmosphere of a mine will cause death. Whenever the smell is detected it is time to retreat to fresh air. One volume of it to seven of air will become a mass of flame when ignited, but the explosive force is small.

After-damp is the resultant mixture left after an explosion of fire-damp, and contains about 7 parts of free nitrogen to 1 part of carbonic acid and 2 parts of steam. Practically, as before stated, after-damp is the air with the oxygen burned out by the explosion, mixed with a little black-damp.

The instruments used to determine whether or not the ventilation of a mine is sufficient are safety-lamps of different types, used for detecting the presence of gas; the anemometer, the barometer, the thermometer, the hydrometer and the water-gauge. The first of the "meters" is an instrument for measuring the velocity of the air current; the second detects changes in the pressure of the atmosphere, caused

by the movement of the ocean air which surrounds the earth; the third measures the variations of temperature, and the fourth is a combined instrument for determining the amount or proportion of moisture in the air of a mine, so as to ascertain its density and capacity for heat. The latter instrument, however, is only used for fine scientific experiments. The water-gauge measures the pressure or force expended on every unit of surface of the area of section, to create the velocity and overcome the resistance to currents of air.

Ventilation is produced by fans, furnaces, displacement machines, steam jets, the exhausts from underground steam engines, and sometimes, in case of accident, compressed air. Falls of water have also been used in shafts to start a current of air after accidents. All these appliances practically explain themselves. The fans force the air into the mines; the furnaces placed at the bottom of the mine, in the passage between the two shafts, heat the air, thus forcing it upward; and displace-



The Ventilating Fan

ment machines achieve the same results by drawing the air away so more must take its place. All motion creates air currents, therefore the action of steam jets and falls of water is explained. The difference in the volume of air needed must necessarily be judged by the time of year and climatic conditions, so it becomes necessary to watch closely every atmospheric change. The anthracite mine law calls for 200 cu. ft. of air per minute for each employee. Allowance must also be made for animals and lights. In a mine where 30 mules are at work and 300 lamps are burning an additional 65,000 cu. ft. per minute is necessary.

Poor ventilation is not always responsible for mine disasters. Side by side with this menace to human life walks the ignorant, obstinate miner, who refuses to adhere to the rules gov-

erning his part of the work. By carelessness he holds the lives of his companion workers within the hollow of his hands. If he is working in a mine where fire-damp is prevalent, and his safety-lamp is extinguished by some accident, he has orders to return to the surface to relight it. But that takes time, and time to him means just so much more money. "What's the difference?" he says to himself. "It won't cause an explosion to light it here." The next moment the naked flame may have caused an explosion, and he with hundreds of others be fighting a losing fight for life. A day or so later the experts arrive to try and determine the cause of the disaster. This is only one example of the fatal results of carelessness. It may be a naked flame, or it may be an overcharge of powder, deliberately used by a miner who thinks to gain by the extra amount of coal dislodged. Sooner or later the result is disaster, and recognizing this, laws have been enacted in some coal-producing countries making such carelessness criminal, whether disaster results or not.

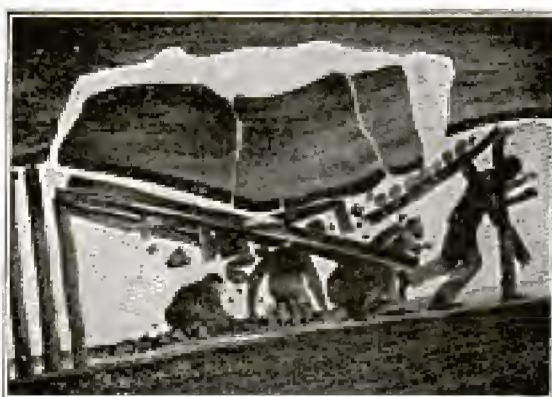
* * *

One of the longest wireless messages ever sent under similar conditions was received at the Eiffel tower station, Paris, from the warship "Kleber" at Casablanca, Morocco, 1,174 miles away.

* * *

Asbestos sheets are being instituted under the mattresses of sleeping cars on some of the railways of the United States to shut out the heat from the radiators underneath.

* * *



When the Roof Falls

A novel method of pumping liquids from bore holes is by means of an endless rope, somewhat after the fashion of the chain pump, only in this case the liquid to be raised is absorbed by the rope and squeezed out between rollers at the surface, says Mining Science. As the rope is in balance the only power required is to overcome friction and raise the liquid,

GAS POWER TO RUN GREAT STEEL PLANT

The machinery of the greatest steel plant in the world, now under construction near Chicago, is to be driven by a gas power plant which will be the largest in the United States, and one of the largest in the world. To drive this machinery it is estimated that fully 100,000 hp. will be required. Sixteen blast furnaces and 1,200 coke ovens of the by-product type will constitute the gas plant, the company believing that by-product coke will be the best for the purpose. It is impossible to determine at the present time the amount of gas that will be thus obtained, but it will be many millions of feet daily.

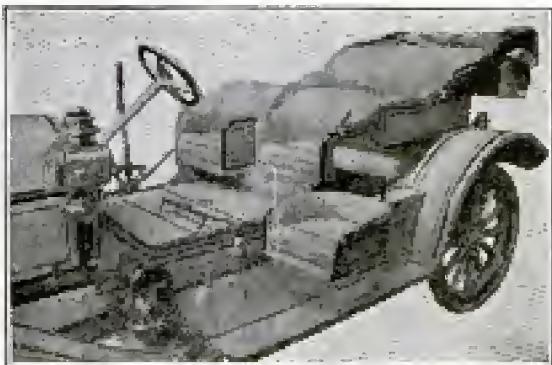
The gas engines will be gigantic in size. Many of them will be of 3,000 hp., each of which will require a building 100 ft. wide. The estimated cost of the steel plant is \$75,000,000. Such a gas plant will also cost millions.

OPERATING TABLE FOR HORSES

On the roof of the largest hospital for horses in the world, which is located in New York, is a sun parlor. Within its pleasant confines the convalescent horses bask in the warm sunshine with

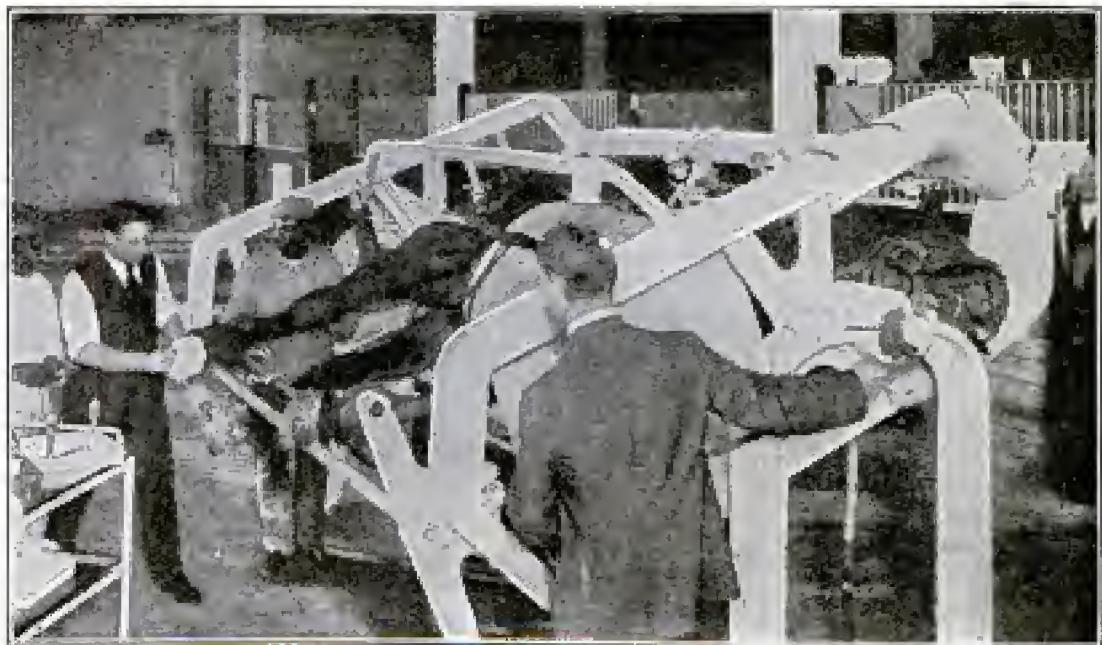
the selfsame enjoyment felt by human patients in the sun parlors of hospitals for ailing mankind.

In the room below is the operating table shown in this illustration. It is a great steel frame which revolves like a wheel on an axle. The horse to be operated upon is led to the frame and securely fastened by straps and padded bars. When all is ready, and the anesthetic administered, the frame is swung into the position most convenient for the operation.



NEW AUTOMOBILE SEAT

A feature of one of the new 1908 automobile designs is an extra seat for a mechanician. This seat is fastened on the footboard of the automobile and can be folded up when not in use. The



Operating Table in New York Veterinary Hospital

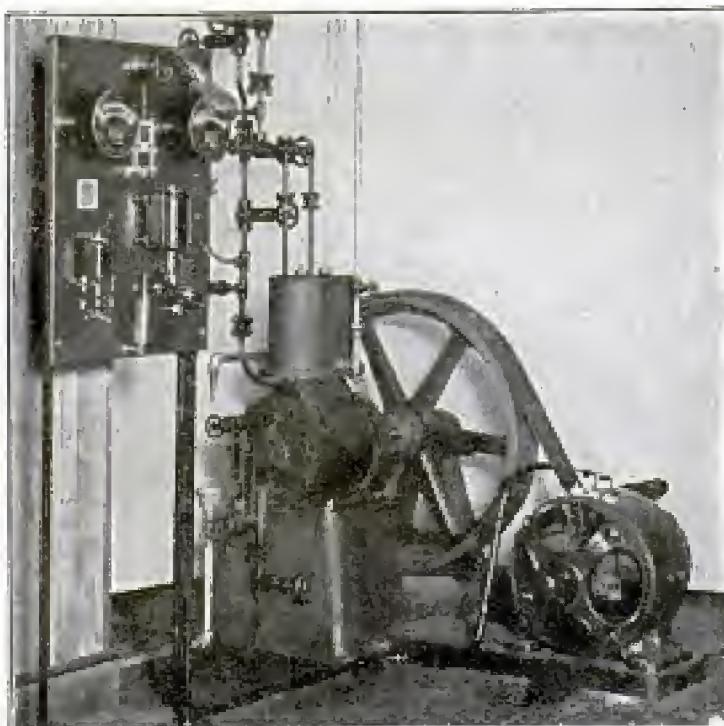
seat was added as a place for the chauffeur when the owner wishes to drive and the car is crowded.

ICE BOX WITHOUT ICE

The modern kitchen refrigerator has been reduced to a science. There is no longer any need to hang out cards or watch for the ice man; no spoiling of food because the ice melted away too fast; no cleaning of slime or stopping of the waste pipe, because there is no dirty ice to melt and no water to get rid of. There being no ice, all danger of typhoid germs coming into the house through that medium is removed. When one begins to count the inconveniences in connection with the use of ice in the household the number is surprising.

In our January number some of the labor-saving features of electrical household utilities were described, but none of them were self-acting; each required starting and more or less attention afterward. The illustration shows to what perfection and simplicity a small cold storage system has now been brought. The outfit consists of an electric motor belted to a pump, which keeps a cooling solution moving through a set of pipes which are placed in the refrigerator. These pipes are similar to the steam or hot water radiators in the living rooms, only they cool instead of heat the apartment. The machine is entirely automatic, and constantly maintains whatever degree of cold is selected. The moment the thermometer rises above that point the machine starts up of itself and works until the apartment is sufficiently cooled; then it stops of itself. The whole affair is so simple as to require practically no attention, except an occasional oiling which is no more difficult than to oil a sewing machine. At trifling expense one can also

fix up a basement room as a cold storage for large supplies such as barrels of apples, jars of butter, sacks of potatoes, etc., which are now impossible to keep in the average residence. In many families the saving effected by purchasing supplies in quantities instead of from day to day would be enough to pay the entire cost of operating the cold storage system; if not, the amount formerly spent for ice certainly would.



Residence Cold Storage Outfit

Such a plant takes little room, can be placed out of the way in the basement, does not cost a great deal to install and lasts for many years.

QUEER PRANKS OF WIRELESS TELEGRAPHY

The queer pranks of wireless telegraphy when conditions are not just right have been exemplified at a Swiss Marconi station, where a variety of messages not intended for that station were received from all parts of Europe.

A snowstorm put the St. Gotthard station out of commission, and a temporary station was erected in a valley at the foot of the Dent des Mordus, the receiving apparatus being fixed on the

Summits of two pinnacles of rock instead of the usual poles. When the operators attempted to communicate with the Rigi station they were unsuccessful, but were swamped with messages from nearly every Marconi station in Europe, in English, French, Italian, German and Russian.

TERRIFIC LOCOMOTIVE EXPLOSION

By the recent explosion of an engine on the Northern Pacific railway near



Scene Immediately After the Explosion

Mace, Idaho, three men were killed. The body of one of them was thrown into the yard in front of his mother's house, which the train was slowly passing when the accident occurred. The force of the explosion was terrific, as can be seen by the illustration. Part

of the boiler was blown 300 ft. up the side of the mountain.

VIOLINS AGED BY ELECTRICITY

A noted violinist and violin maker believes he has discovered a method for giving, by the aid of an electrical machine, the same quality of tone to a violin that age has been credited with providing. The theory of the violinist is that it is not the age of the violin which really gives it its superior tone, but the amount of "bowing" or vibration it has received. By the use of the electrical machine the violin is expected to get as much "bowing" in 30 days as the same instrument would receive in 50 years of ordinary use. The details of the machine, which works the bow across the strings with almost human touch, are as yet a secret.



Blown 300 Ft. Up Mountain

The Argentine Republic is planning to hold an exposition in Buenos Ayres in 1910.



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The above view and that on the opposite page are from one photograph taken at Hampton Roads just before the sailing of the American Armada. The mosquito fleet of

THE STEADY GROWTH OF THE U. S. NAVY

Although the average American would fight the moment his patriotism were questioned, very few realize how much or how little the Navy is growing or how many or how few fighting machines are being constructed. He reads in his morning paper that the keel of a great ship is about to be laid, or the hull of another launched. For the moment a glow of satisfaction is felt and then the incident is forgotten in the stress of business or other cares.

Only when such events as the sailing of the Battle Fleet for the Pacific are taking place does the American seem to be alive to what is occurring. Foreigners coming to this country, especially the English, are struck with this seeming indifference and cannot understand it. Later, however, they see be-

hind it the patriotism which remains dormant when "it is to talk," and comes forward when "it is to fight."

There are at present 29 ships building for the U. S. navy, against 22 a year ago. They comprise the battleships "Mississippi," "Idaho," "New Hampshire," "South Carolina," "Michigan," "Delaware" and "North Dakota"; armored cruisers "North Carolina" and "Montana"; scout cruisers "Chester," "Birmingham" and "Salem"; 5 torpedo boat destroyers, and 7 submarines. The battleships "North Dakota" and "Delaware" are of the "Dreadnaught" class, with a displacement of 20,000 tons. The other battleships have a displacement of 16,000 and 13,000 tons.



Edwin Levick, New York.

Steam launches are bearing the Admirals and other naval officers to the President's yacht, the "Mayflower," seen at the right.

DECAY OF PAPER DUE TO BACTERIA

German scientists, after devoting deep study to the question of the decay of paper, have found that bacteria is the chief enemy to be met with in the preservation of valuable books and manuscripts.

The brownish spots which appear in old books are really due to the ravages of bacteria. The tiny destroyer is especially fond of starchy material, and its propagation is promoted by damp. It has been well understood that damp produced discoloration and decay, but the share of the microbe in the operation has not hitherto been suspected. Working shoulder to shoulder with the bacteria (presuming bacteriaites have shoulders) is the tiny fungus or mold, which is responsible for gray and black

marks upon old papers. In spotting the surface the fungus helps to break down the fabric and hasten the process of its destruction.

PROPOSED WONDERS WITH RADIO-TELEGRAPHY

The report comes from Paris of a device which will enable an operator in a distant station to control with radio-telegraphy the explosion of mines, firing of rockets, steering of torpedoes and other military operations. The principal feature of the reported contrivance is what is called an automatic telegraph. Over it comes a radio-telegram from the object being operated upon, which notifies the operator whether or not he has succeeded in setting the mechanism running. The radio-telegram is received on a band of paper through a Morse receiver.



A rotary pump mounted on the rear of an automobile and belted to the flywheel. Used instead of hand pumps for pumping out the manholes of electric light conduits in New York City.

THE FIRST AMERICAN GRAIN MILLS

People the solitude this illustration shows with the Indian squaws of a hundred years ago and you have a typical Indian grain mill in full action. Close to nearly all the springs of the western states, whether they be located in fertile valleys or among mountain peaks, can be found these peculiarly hollowed stones. On them the Indian squaws ground the corn and other



Early Flour Mills

grains with which they fed their bucks when on the warpath or following less savage pursuits.

EAST RIVER TUNNEL STOPS CONGESTION

The Brooklyn bridge crush which has for years been the wonder of all who looked upon it from the outside and the despair of all who had to become part of it, is over, according to those who had tried nightly to regulate it. On the first day the subway tunnel under the East river was opened 140,000 passengers went through the tube. That means that 140,000 less people crossed the bridge.



CONCRETE DOME IN MOLD

This concrete dome, with the forms or molds still in place, is part of the roof of a beautiful chapel in Los Angeles, Cal. The dome is 32 ft. in diameter and about one-half that height. The ribs of the form were first set, and then workmen placed the short boards in place as the concrete was poured in. At certain points the outer and inner forms were fastened together with $\frac{1}{2}$ -in. bolts. The concrete is 5 in. thick.

An electric forge designed for sharpening drills is being tested in one of the South African mines. If it proves successful drills will no longer have to be carried to the surface for sharpening.

HUGE MINE PUMPS

The difficult problem of designing a mine pumping plant of the small dimension required, because of limited space, and yet capable of making an impression upon the immense inrush of water, has been solved in an English mine by the use of electricity and high velocity pumps. The two shafts in which the pumps are being used are only 8 ft. by 6 ft. in dimension.

This illustration shows one of the pumps, driven by direct-connected motors, capable of delivering 4,000 gal. of water per minute to a height of 395 ft. On reaching a depth of 278 ft. two of these pumping sets are joined in a series. Together they can deliver the full quantity of 4,000 gal. per minute as high as 780 ft. The pumps rest upon carriages of structural iron which run on rails having a gauge of 6 ft. 6 in.

The weight of the pump, complete with motor, suction and delivery pipe, suspension cable, electric cable and its own column of water is about 75 tons.

WHAT DOES IT COST TO RUN AN AUTOMOBILE?

It would appear as if this simple query were susceptible of about as many shades of answer as the famous one regarding matrimonial ventures, says Automobile. It costs one autoist several hundred dollars for tires alone in the course of a year, while another finds that he spent but a fraction of that amount to cover almost the same distance under very similar circumstances.

One man's repair bills are excessive, while another gets an equal mileage



and more enjoyment out of his at a cost but slightly in excess of what he would have had to pay to keep a horse in oats and shoes during the same time, and the queer thing about it all is that frequently the various cars have been maintained under rather similar conditions. The carefully itemized account of the Californian who spent almost half the first cost of the car in maintaining it the first year finds its antithesis in that of the autoist who ran his car for two years for little more than \$100.

England has just laid the keel for its sixth "Dreadnaught."



A locomotive on a railway belonging to the Maharajah of Gujurat. It is used for passenger and goods traffic.

CHARTS FOR AIRSHIPS

From the action just taken by the French Aero Club it seems that airships as well as the ships that ride on the sea have to have charts and maps to point out obstacles and show a clear path ahead. A series of maps are now being drafted, and for this purpose a vast number of documents have been collected. The first charts will show the position of telegraph wires, overhead cables and all dangerous obstacles which might be struck by a balloon's guide rope at night. Many overhead cables convey currents of 20,000 volts or more, and contact with such might mean disaster to balloon and occupants when landing.

LOCOMOTIVES TURN THEM-SELVES

The operation of changing the direction of a locomotive on a turntable is one which always attracts the attention of the passerby. To the hostlers or helpers around a roundhouse it is only a tedious routine which happens every time an engine comes in and goes out. Gasoline engines and electric motors have taken the place of manual labor in pushing the table with its tons of weight, in the larger places. These mechanical powers have reduced the cost of operating a turntable by hand from about \$15 per 24 hours to \$5 for turning 400 locomotives.

Now a bright genius has thought of

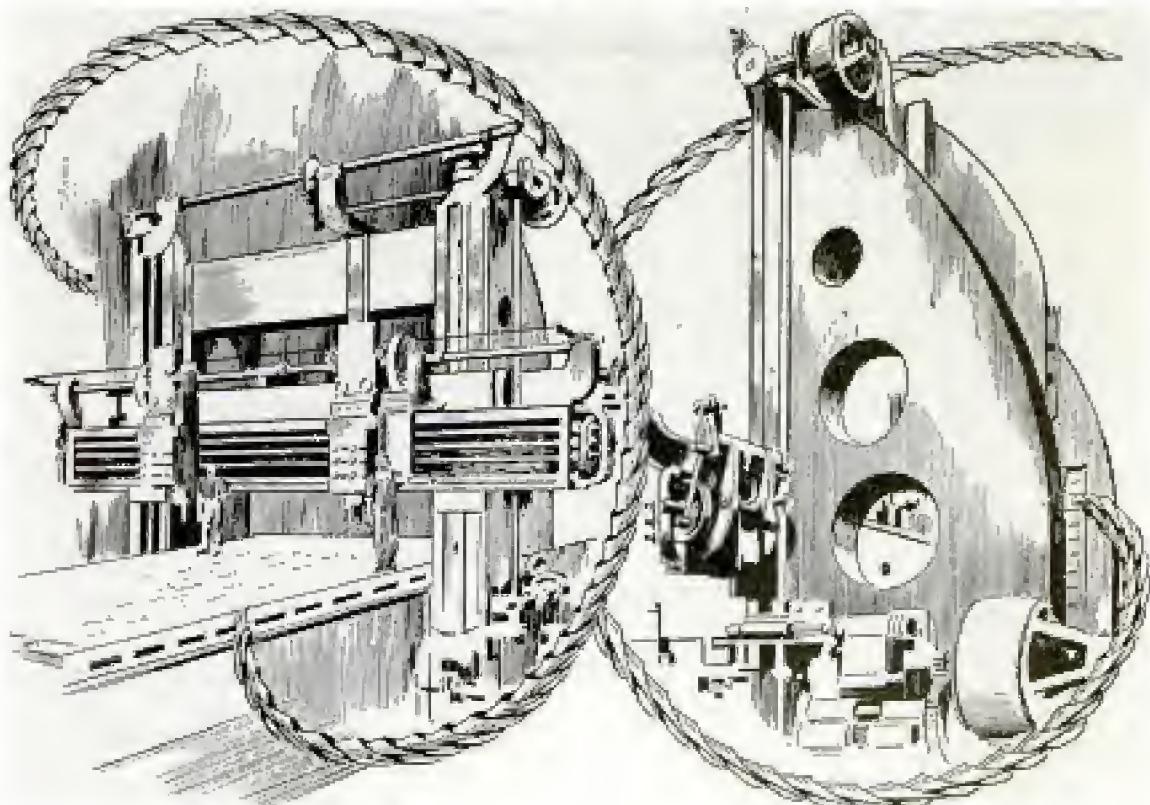
a method the expense of which is so small it can hardly be estimated. It consists of a compressed air motor placed beneath the turntable and operated from air furnished by the air-brake pump on the locomotive being turned. Connection is made between the engine and the motor with a piping and hose. An air pressure of 50 lb. will turn the locomotive, and as the turning is all done in two minutes, the amount of steam used to work the pump is too small to reckon.

The London Times says that the work of pioneers in color photography has reached a promising stage and that a plate is now on sale upon which a fairly satisfactory heliochrome transparency may be made with one exposure, and with little more trouble than an ordinary negative.

LARGEST METAL PLANER EVER MADE

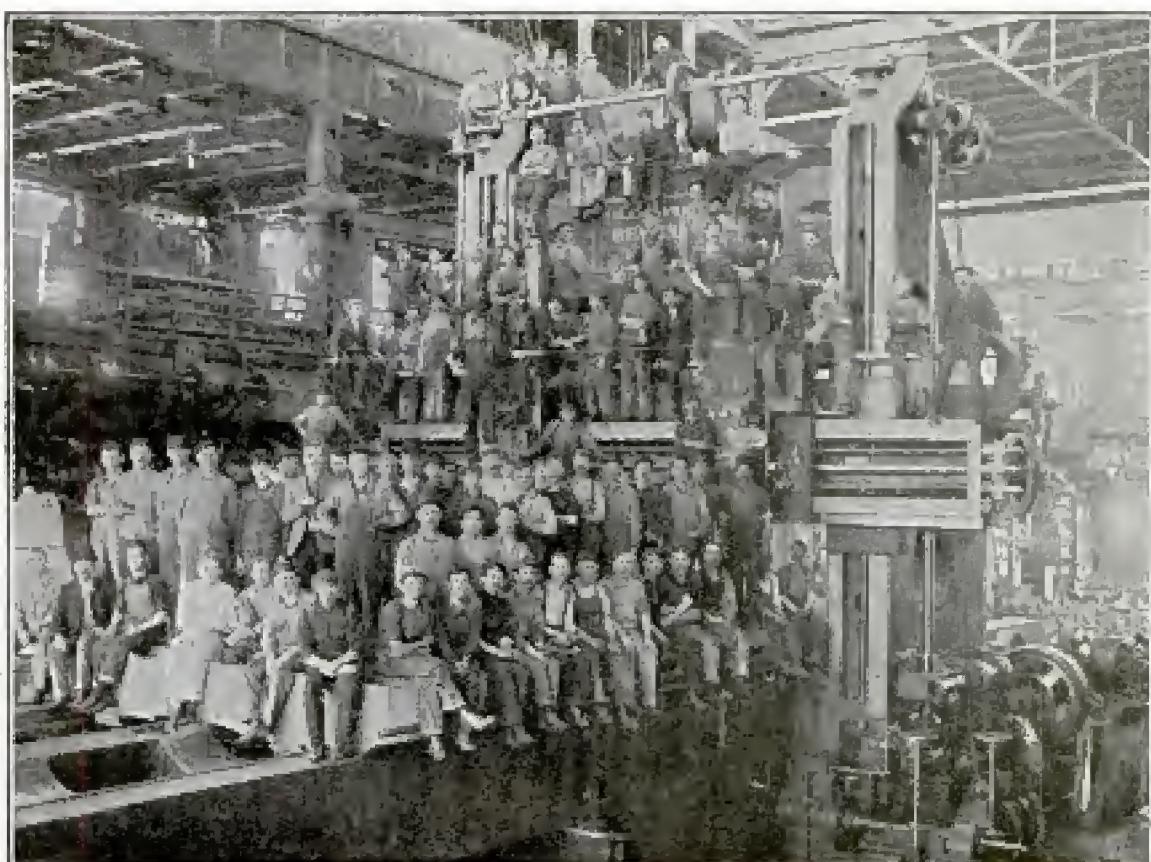
The largest machine for planing metal, and one of the largest machines in the world, has been built for a Pittsburgh iron works. This gigantic tool planes great slabs or beams of steel with less fuss than an average carpenter makes in planing a 6-in. board. The total weight is 845,000 lb.; the table is 60 ft. long with a stroke of 30 ft.; height, 35 ft.; between uprights, 14 ft.; driven by five electric motors aggregating 207 hp.—sufficient power to run a large factory.

LARGEST METAL PLANER IN EXISTENCE



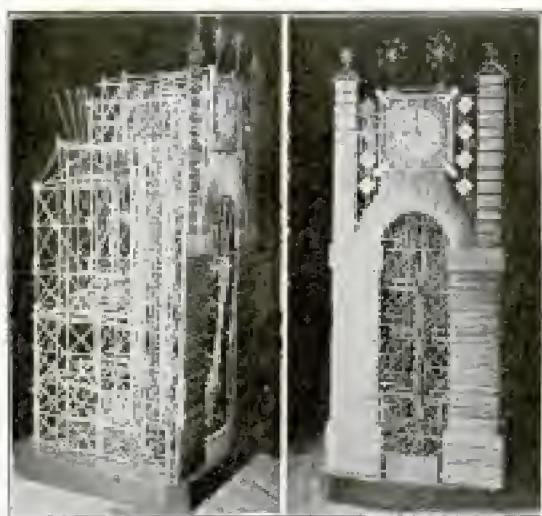
The Mammoth Bed Plate

End View; 35 Ft. High



Courtesy Miller-Bement Co.

Eighty-five Men Grouped on the Big Machine



CLOCK MADE OF STRAW

This clock, made entirely of straw, is 25 in. square and stands 66 in. high. The figures, dial, pointers, pendulum, even the clockwork itself, are constructed of this material. The clock is wound up and the pointers on the dial set by pressing a button. There are no springs used. The complete clock, composed of many thousands of straws, weighs only 7 oz. It was made by a German shoemaker who worked on it 15 years during his leisure hours.

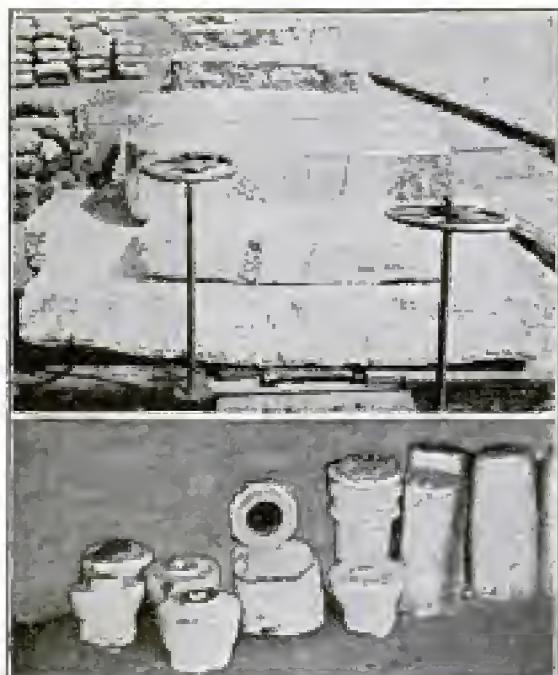
WRECK IN WHICH MANY WERE KILLED

In this tangled mass of passenger coach and engine occurred the majority of the fatalities which attended the appalling wreck on the Great Western railway at Shrewsbury, England. The English corridor coach shown in the center of the illustration lies on top of the locomotive. To the right is the debris of the engine tender, the running board of which is completely buckled up. Just beyond the coach is the remains of the mail car, in which six postoffice officials

met death. The disaster was one of the worst in England's railway history.

ONYX IN THE ROUGH

These two illustrations show onyx as it is taken from one of the Mexican quarries and the same material turned out in the rough on a common iron turning lathe, as half-round spheres to



Mexican Onyx

cover electric light bulbs. This product when not more than $\frac{1}{8}$ in. thick is somewhat transparent. It is only recently that onyx has been mined in such large pieces.



Smash-up on English Railway



Coplay, Pa., Plant Where First Cement in U. S. Was Made

WHENCE CAME AMERICA'S FIRST CEMENT

By Wm. J. Richardson

When the history of the cement industry is written much space must be devoted to the Lehigh region of northeastern Pennsylvania, where, way back in 1850, a "Pennsylvania German," who had heard that the mighty pyramids of Egypt were made of rock ground up and baked into huge blocks, began experimenting with the rocks which cropped out of the ground near his home, and finally founded a business which now, from a narrow strip of land along either side of the Lehigh river, furnishes over 60 per cent of the world's supply of the material which in these days is becoming so extensively used in every form of building operation.

Here, within a belt less than a mile wide and about eleven miles long, nearly 20,000 men are employed every day in the year, turning the cement rock into the ordinary forms of cement and combining it with limestone to form Portland cement, which takes its name, not from the Maine city as generally is believed, but from the little town of Portland, Pa.

As in the steel industry, so with the cement business, the chemist plays the most important part. Portland cement is simply a combination of argillaceous limestone with the natural cement rock, but there are some secrets in the combining process to be guarded, and the cement magnates surround their mills

with an almost impenetrable veil of mystery. No stranger is allowed to enter, and even a near approach is met with a forcible protest, to be followed with a strenuous ejection should the wanderer venture too near.

In the early days of the industry the processes were crude in the extreme. The rock first was baked in huge "dome" ovens, much like pottery kilns in appearance and construction, and then ground in mills run by horse or water-power. Nowadays, once the rock is hoisted from the quarries, everything is done automatically. Machinery conveys it to up-to-date roasters, from the roasters it is carried to the crushers, and from them it goes to the stock houses and into barrels without being touched by a workman.

There is much of the romantic in



Vertical Cement Kiln

the development of the "Cement Belt" from a farm land, none too rich at that, to a teeming valley filled with laborers, skilled and unskilled. Farmers who for years barely succeeded in making enough from their farms to meet the mortgage interest suddenly found themselves rich beyond the most extraordinary flights of their imagination. Barren, rocky soil, upon which the wild carrot, the goldenrod and the Canada thistle were the most prolific crops, and where the tiller of the soil more frequently than not dammed the rocks which were to prove his fortune, suddenly became worth hundreds of dollars an acre.



A Poor Farmer Received \$100,000 for This Quarry

One of the accompanying illustrations shows a limestone and cement rock quarry—the two kinds of rock often lie but a few feet apart—located on a farm of 157 acres, for which the owner received \$100,000 in cash. For the honest, simple-minded old man put no faith in promises or checks and demanded spot cash, and he had to feel the gold in his hands before he would sign the deed. And when it came to signing the deed his good wife would not attach her name until she was assured a new dress, and the dress she was given before the deal was consummated.

But the era for high prices for cement land is past. No longer will a few acres of the rock elevate a man from shanks' mare to an automobile. The average price paid for a property

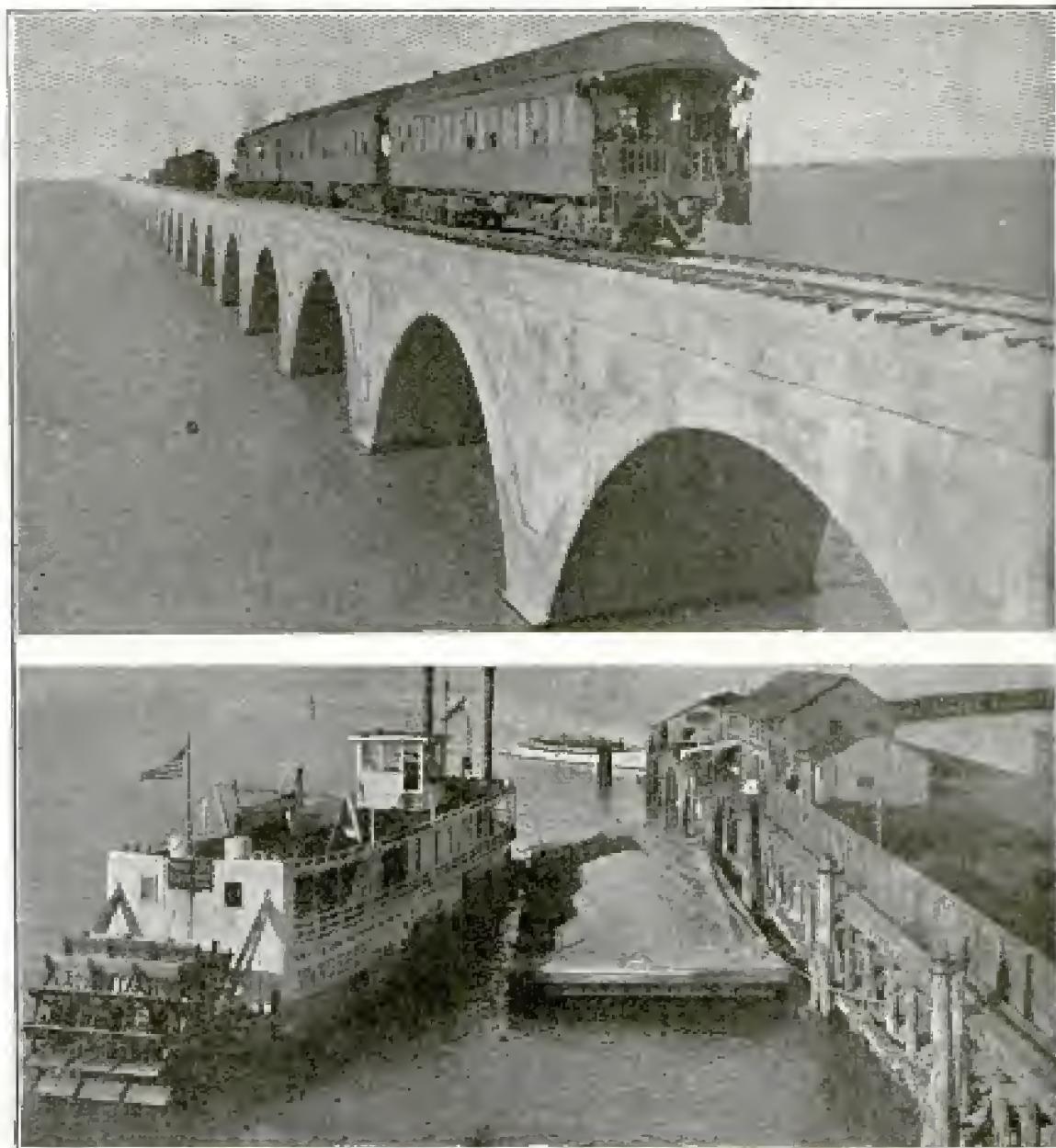
containing the deposit so much in demand is now about \$300 an acre, although there are many tracts which the big cement companies have not secured because the owners are holding out for more money. Probably the present owners and their sons and grandsons will own the land before it is sold, for it is said that the manufacturers now own enough land to supply the expected demand for a half-century to come.

The cement belt has been so thoroughly defined that a map shows its sinuous windings as clearly as the courses of a river. Beyond its confines no cement exists that has a commercial value. The deposits of cement rock seem almost inexhaustible, but there is an appreciable lack of the right kind of limestone, and a man who owns land upon which there is a goodly quantity of argillaceous rock need have no fear of the wolf ever howling about his door. Today much limestone is being brought to the Lehigh region from distant points, and it is said that a fortune awaits the man who can devise some method by which ordinary limestone can be made to produce equal results when fused with cement rock as the sort that now is used.

What titanic convulsion of nature threw up the two ridges of rock, sometimes close together, sometimes with one superimposed upon the other, no one knows, but it aptly illustrates what fortunes dwell upon the hazard of a die and what Fate had in store for the one man who dared to put it to the touch to win or lose it all.

SHIP BUILT TO CARRY SUBMARINES

A report from Paris states that Japan is having constructed by the Maxims in France a new type of ship the express purpose of which will be to transport submarine boats to the scene of battle. The submarines will be stowed away in a tunnel traversing the hold of the vessel, and by means of locks they can emerge from this safe



First Train Over Completed Section of Ocean Railway

haven unperceived by the enemy. By this arrangement a long sea voyage, which is one of the greatest difficulties to be faced in submarine warfare, will have no terrors.

FIRST SECTION OF OCEAN RAILWAY COMPLETED

The first section of the ocean railway to Key West has now been opened and trains are daily running over it to Knight's Key, the temporary terminal. From the 2,000-ft. trestle extending out from this key to the new steamship

dock, passengers can board a ship and after a trip of only 115 miles, accomplished in a little over 7 hours, be landed in the Cuban capitol. Already the time between New York and Havana has been reduced half a day, and when the road is eventually completed the time will be still shorter. In the meantime work is being pressed on the remaining 47 miles which intervene between Knight's Key and Key West.

There are nearly 5,000,000 subscribers' telephones in operation in the United States, or one for every 18 persons in the country.

RAPID-FIRE GUN OF NEW DESIGN

Major W. H. Fitzgerald, of the English army, said to be the inventor of the first machine gun, is also the inventor of the latest. The new production of his inventive genius will, if as successful as many European gun experts believe, displace all other machine guns for many kinds of warfare.

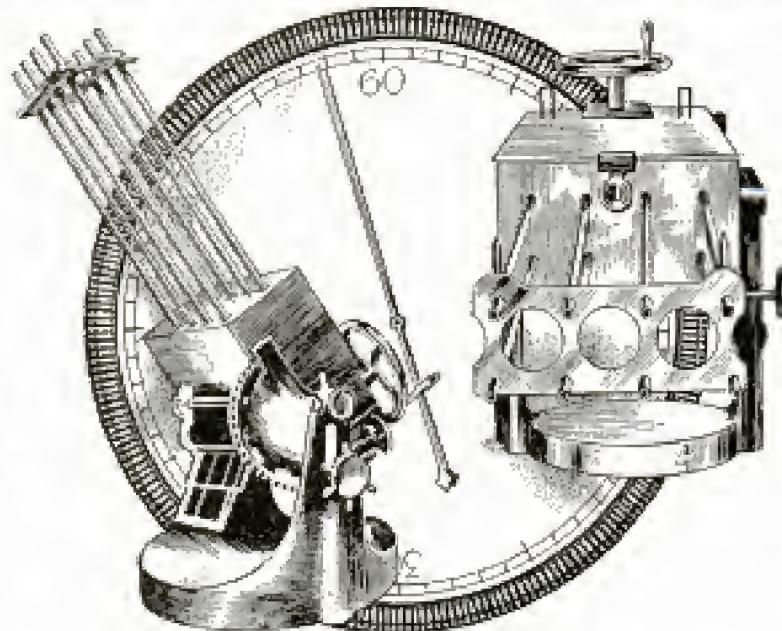
The gun contains 8 barrels, arranged in two tiers of four, and will discharge 460 shots a minute. Its greatest feature is the patent cooling chamber, which allows it to be fired for an unlimited time without becoming overheated. The "Maxim," the gun it most closely resembles, can only fire for a period of 10 or 15 minutes before an interval is allowed for it to cool.

The second great feature is its construction, which makes it possible to fire it down the precipitous side of a mountain, straight into the air, and to any point of the compass. The inventor claims it is as cheap to make as the "Maxim" and that the mixture required for the cooling chamber costs only 12 cents a month per gun.

EXPLODING A MINE IN GRANITE

One of the methods of quarrying granite is to dislodge a huge sheet from the surface of the formation through the medium of a powder mine. A large perpendicular shaft is first blasted to a depth of about 30 ft. At the bottom of this, and radiating in all directions, horizontally, like the spokes of a huge wheel, long holes are drilled. The extremities of these holes are then shot with light charges of dynamite in order to create chambers large enough to re-

ceive large quantities of black powder. This takes weeks of ever increasing charges. Then the final charge is loaded. The now huge chambers at the extremities of the spokes are packed with hundreds of pounds of powder,

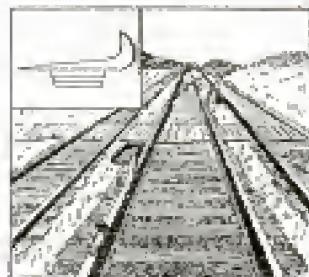


numerous electric wires attached, and the whole mine tamped with fine material. A mighty roar and rumble in the bowels of the earth and the huge sheet is detached from the ledge.

RAIL BRAKES FOR STOPPING CARS

Instead of having a force of brakemen in many of the German railroad yards, the track brake, or shoe, shown in the illustration, accomplishes the task at the desired time and place.

The yards in which they are used have a hump at one end from which the cars run down into the yard by gravity. An operator with a number of these shoes, or "gleisbremse," as they are called, in his hands, judges the speed with which the cars are running and places a shoe on the track at just



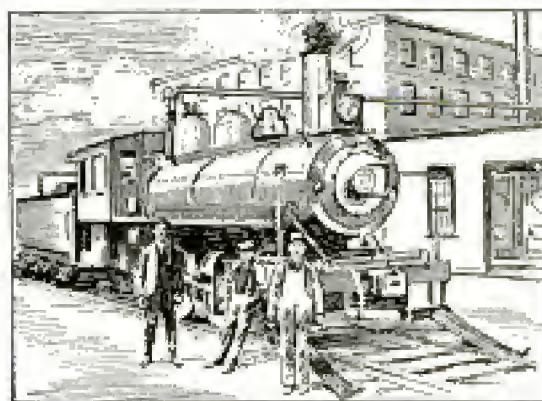
the right point to stop them where wanted. When the car strikes the shoe the wheel comes nearly to a rest. The shoe then slides along the track until it strikes a cut-off in the rail and shoots into the pan, while the wheels are kept in position by the guard rails on the other side.

SUN'S RAYS DAMAGE SHIPS

In docking vessels on the Great Lakes during the winter months the bows are pointed in one direction one winter and in the opposite direction the next. This is done because while lying at the docks one side is much more exposed to the weather than the other; not the bad weather of snow and rain, but the finer weather of bright sunshine. Sunlight reflected from the water has a strong tendency to rot timber, and vessels always wintered in one position will require new decking and bulwarks on the water side in nearly half the time required to rot the timbers on the dock side.

LOCOMOTIVE RUNS TOY FACTORY

During the installation of new boilers at a large toy manufacturing plant in Massachusetts recently it would have been necessary to shut down the machinery for a few days and allow a rush of "hurry up" orders to go unfulfilled had it not been for the Yankee wit of one of the superintendents. He



A Yankee Trick

solved the problem by chartering a locomotive from a railroad and blocking it on a side track in the factory yard. The pipe leading from the boiler of the locomotive to the cylinders was disconnected and attached to another pipe leading into the factory engine room and thus furnished the required power to run the factory engine.

GIANT SAFETY PINS

It is quite a stretch of imagination between the safety pins in common everyday use to those large safety pins



used in a meat packing plant for hanging up strips of bacon and hams in a smokehouse. The pins are 12 in. long by 6 in. wide, and are made of $\frac{3}{4}$ -in. steel wire.

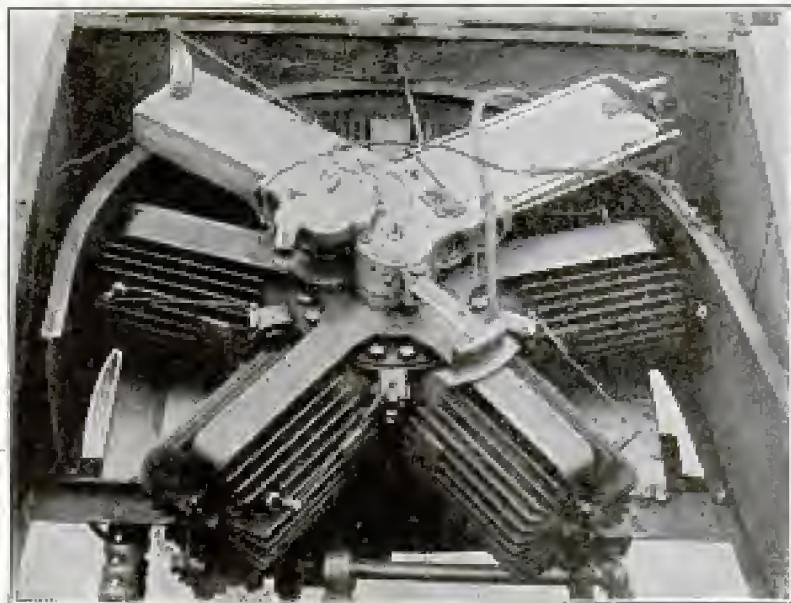
BRAZILIAN BOAT BUILT OF BRONZE

Owing to the great amount of decomposed vegetable matter contained in Brazilian waters, which causes rapid deterioration of thin steel, the hull of the new dispatch boat "Guanabara," built for the Brazilian government, is constructed entirely of bronze. Against this metal the corrosive action of the Brazilian waters has no effect, and although more costly, both in material and construction, the vessel is much lighter than if built of steel or wood. The propeller shafting and propeller are also of bronze.

The British government is building a number of immense oil tanks at various ports around the British Isles for the use of her warships now using oil for fuel. The tanks will be surrounded by mounds to protect them against gun fire from the sea.

A REVOLVING CYLINDER MOTOR

In building the various types of motors containing more than one cylinder for automobile use, light weight with as much power as possible are the two principal things to be considered. There seems to be little change from the main order of construction in these motors. A new motor is now made in which the cylinders form the flywheel and revolve around the shaft. This dispenses with the heavy weight of the flywheel and the material used in making the long crank shaft, crank box and bearings. It has a gyroscopic effect and spins something like a top, causing lubrication by centrifugal force as well as closing the valves without springs and forcing the heaviest part of the mixture to the ends of the cylinders. No fan or other method is used for cooling, as the rapidity with which the cylinders revolve throws off the hot air.



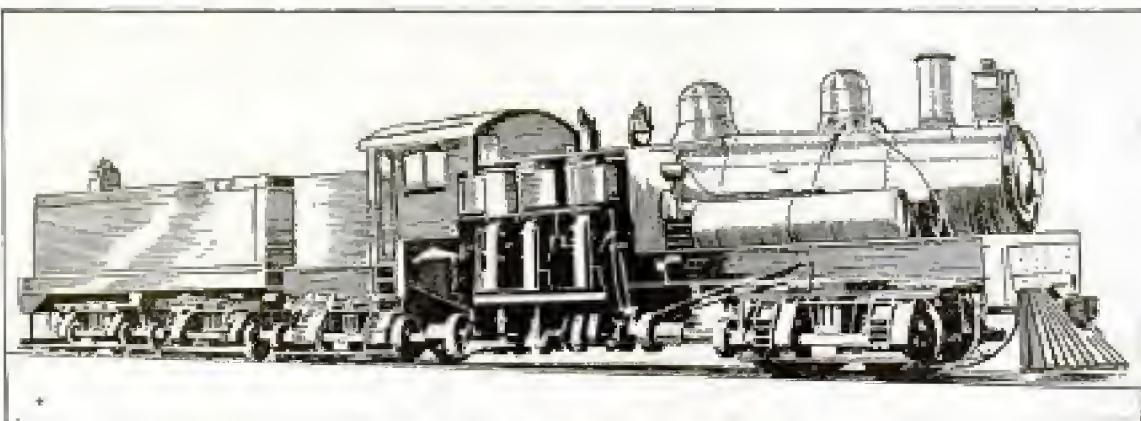
The Cylinders Form the Fly-Wheel

driven by three cylinders. The driving wheel base is 58 ft. and the weight on drivers in working order is 297,500 lb. The gearing of the locomotive more than doubles its hauling capacity.

One of the remarkable features about the locomotive is its high tractive power as compared with its weight and the sharpness of the curves around which it will run. The maximum tractive power is 53,000 lb., and the sharpest curve that may be taken is of 150 ft. radius.

DRIVE WHEELS EXTENDED UNDER TENDER

The two heavy trucks under the engine tender form part of the driving



Every Wheel Is Made a Driving Wheel

force of this large locomotive in use on the Southern Railroad. The idea of gearing the trucks of the tender in the same manner as the locomotive itself is to add the power more driving surface and weight gives. The wheels are turned by a shaft and beveled gear

STOVE MADE OF REVOLVERS

It is understood that the police court at Portland, Ore., is to have one of the most unique stoves in existence, made of revolvers taken from prisoners during the past few years. The idea of having them made into a stove came from Municipal Judge Cameron, who believed it would be a questionable procedure to sell them at auction, and could think of no other way to dispose of them. Consequently the firearms were turned over to a foundryman, who promised to make them into a stove.

MODERN CLIFF DWELLERS

The steady expansion of the high building idea seems destined to produce a race of modern cliff dwellers, who will be able to spend their entire lives, if so disposed, without the absolute necessity of going once outside their lofty dwelling. The trend of city life as measured by the past few years makes the prediction of Theodore Starrett, who recently completed a 40-story building in New York, seem well within a possibility. He says:

"Attacks on tall buildings as monstrosities may be all right from an esthetic point of view, but one learns to doubt the motives of these attacks.

"The top stories of these tall buildings are great places in which to live and of all places to sleep in—so quiet, so well ventilated. Some chap will come along with hotels and apartments in one end of his buildings and with a market place and a theater at the middle, and with an office building at the other end and a railway terminus under it all. If there is a roof garden on the top, there you have it all.

"Back to the simple life for the inhabitants of this building. No weary journey home at night. No half hour or so wasted every morning trying to read a newspaper in a suburban train.

"The tenant in one of these 'ultimate' buildings can go from his office to his apartments or to the roof garden in two minutes; or, if he lives in the

suburbs, he can take his train, just as he now takes the elevator, in his building. It will prove a conservatism of energy, impossible even to the most luxurious plutocrat.

"It looks to me as though we are just starting to get our ideas in shape; we have really done no more than make the first beginnings in building improvements."

ELEVATOR MOVED ACROSS A RIVER

It was found necessary to move this elevator to a new site because a rail-



A Roving Elevator

way company had taken up the tracks leading to it. A river lay across the path to be taken, but this seemingly un-

surmountable obstacle was overcome by building a crib trestle up from the bottom of the river between two wagon bridges. The top of the trestle rose several feet above the surface of the water.

MILLION-DOLLAR CONCRETE POWER PLANT

Many features are found in this California million-dollar power plant,



BUILT ON SAND

among the most interesting of which is the fact that it is built of concrete, its two reinforced stacks rising 160 ft. into the air. The entire plant, including three upright compound engines of 7,000 hp. each, rest on foundations built on dense sand. Although some difficulties with sea weed and kelp have been met with, the condensers are cooled with sea water. The plant is situated at Redondo, about 20 miles from Los Angeles.

SHEET METAL TUBES DRIVEN INTO GROUND FOR WELLS

The sheet metal tubing or pipe shown in this illustration is being successfully

used in the west for driving deep wells in place of the more expensive screwed pipe usually used for the purpose. The process is simple. Two pieces of No. 16 steel tubing, one piece slightly smaller than the other, are alternately slipped together, effectively doing away with all joints. On the end of the first section, which must be four or five times as long as the others, is placed a steel shoe. As the pipe is driven into the ground the short inside and outside sections of tubing are added until the pipe has been driven the required distance. In this way the tubing can be driven several hundred feet into the earth.

"MOTORITE" TO DOUBLE SPEED POSSIBILITIES

A new motive power known as "motorite" has been invented by Hudson Maxim, who believes it will revolutionize torpedoes and torpedo boats, and possibly in the future replace steam as a motive power for ships of all kinds. As the inventor of the machine gun which bears his name, Maxim has a world-wide reputation, and whenever he is prepared to launch something new he is watched with expectation.

The new power is said to be a combination of certain powerful explosives. Maxim is reported as saying that by the means of it the ordinary-sized torpedoes can be sent through the water at a speed of 60 miles an hour, while the best of the gasoline-propelled torpedoes cannot be driven faster than 35 miles. In connection with "motorite" Maxim is at work on a torpedo boat which he believes can be propelled by it at a speed of from 50 to 60 miles an hour. Not only does he believe that

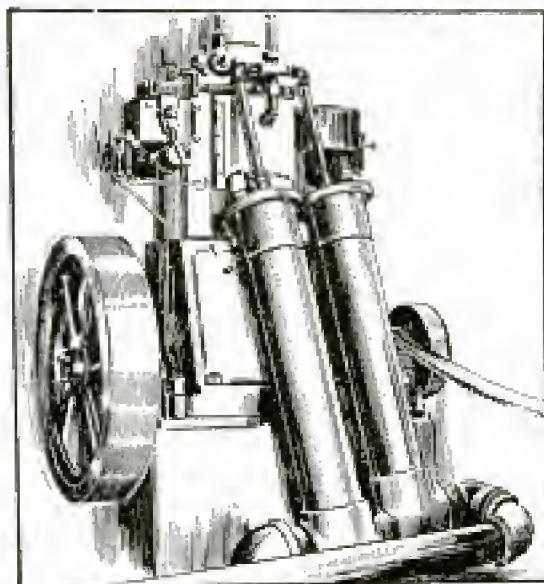


Sheet Steel Tubing for Driving Wells

the new power will revolutionize in this line, but, according to reports from England, he thinks it possible that the future will see "motorite" used to drive merchant ships at twice their present speed.

GAS ENGINE EXHAUST UTILIZED FOR HEATING

In this illustration the heat in the exhaust gases from a two-cylinder 50-hp. gasoline engine is being utilized by means of two heaters or pipes into



Exhaust Heating

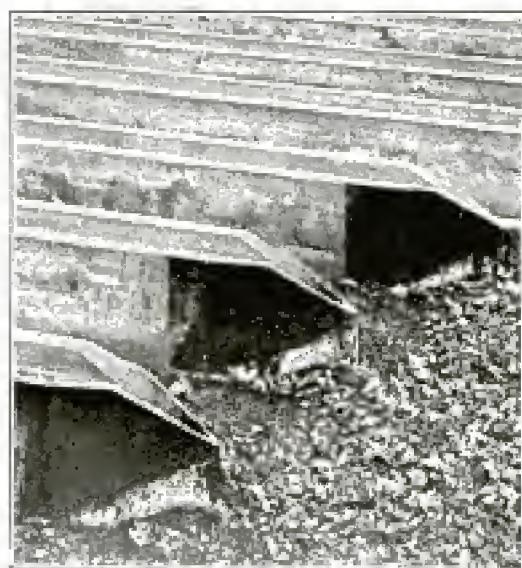
which the exhaust pipes discharge. The heat thus received was sufficient to displace a large hot water heater,

WHAT MAKES "RAIN" IN MOVING PICTURES

Moving-picture films are practically spoiled long before their life of usefulness should end because of the "rain" which blots out the clearness. This injury comes from the continuous winding and rewinding of the film through the machine at the rate of a foot a second, forming static electricity. The electricity attracts all the particles of dust and dirt floating in the atmosphere to the films, and in pulling the film up tight these particles scratch, hence the "rain."

SQUARE SECTION CONCRETE PILES

For the first time in that part of the country, concrete piling is being employed by the Detroit park commission in the reconstruction of a large steamboat dock at Belle Isle. The piles are pointed at one end, to permit their being driven, and have a flange on one side which fits into a groove in the next pile where it is desired to drive two of them close together. Something over 100 of these piles will be used in the work. Their cost has not been definitely determined, but the park commission estimates that it will not exceed that for creosoted piles of the regular type. Concrete piles have been employed by



Cement Piles Last Forever

the government for dock purposes with very satisfactory results. The driving point is cast sharp and the upper end flat. The piles are 20 ft. in length.

DRILLING CLOSELY SPACED HOLES

The drilling of closely spaced holes is always a problem for the designer. The smallest distance holes can be

Arrangement of Drills

spaced by the usual method is determined by the diameter of the drill spindle and of the gear or pulley driving them. The engraving shows the finished work where two rows of $\frac{1}{2}$ -in. holes were drilled by using a drill head where only the size of the drill spindle and the chuck, together with the spindle bearing, had to be taken in consideration, says American Machinist. The drilling head is a complete unit in itself, and it can be removed at will and another entirely different drilling head substituted for other work. The drill spindles are of tool steel, hardened and ground. Each spindle has a crank on the upper end, the crank-pin or driving portion going into a revolving driver which has a main driving pin. This pin enters a hole which is drilled eccentric to the outside in the main

driving spindle. The small cranks nest closer together than is possible with gears, or pulleys with belts.

SHIPBUILDING ACTIVITY ON THE GREAT LAKES

During the year 1907 the ship yards on the Great Lakes, exclusive of the Canadian yards, launched 56 vessels, of which 40 were bulk freighters. The combined carrying capacity of the 40 bulk freighters is 368,000 gross tons for a single trip, or 7,360,000 tons in an average season of 20 trips. The Canadian yards during the year launched two bulk freighters and two car ferries. The vessels now under construction in the Great Lakes ship yards for 1908 number 42, of which 26 are bulk freighters.

SAND SUCKER TURNS TURTLE

The steam sand sucker "Root" suddenly turned turtle recently in the harbor at Kenosha, Wis., drowning three of its crew who were asleep in its cabin. The accident was caused by its load of wet sand shifting over to one side. The vessel was righted by driving piles on

Raising the Boat

each side and connecting them with beams. Heavy chains were so placed that when the work of pumping out the water and sand was commenced the boat gradually turned over again, properly righting itself.

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A YEAR OF SCIENTIFIC-MECHANICAL TRIUMPHS

The year 1907, now numbered among the countless years gone by, held its own with any of them as far as the world's advancement in science is concerned. In every part of the civilized world scientists and inventors, some known to fame and others still undiscovered, enlisted their brains and hands to clutch the forces of nature and harness them to the work of man.

Among the most prominent advances in applied science was the practical completion of trans-Atlantic wireless communication. There are still many details to be solved, but the two continents of Europe and America are now within the wireless zone.

Following closely upon wireless telegraphy comes wireless telephony and the transmission of photographs from one place to another over telegraph wires. The former is receiving practical demonstration every day through Admiral Evans, who sits in his quarters on the flagship "Connecticut" and talks with his officers on the other ships of the Battle Fleet. The latter is not so far advanced, but it has been proven practical by actual results, and the close of 1908 will probably see it in general operation.

Flights in Germany, France and England have proved the dirigible airship practical for warfare, with the result that military experts are being kept busy devising new lines of defense.

Old cavalry equipments fell into disuse by the advance in artillery projectiles; the two largest passenger steamships in the world were launched and broke all trans-Atlantic records. Great advancement was made in the electrification of railroads, and Edison has invented a concrete house which will cost no more than \$1,000. More inventions have been made and more scientific problems solved than are realized, and countless more will startle the world before the year 1908 joins 1907 as part of the past.



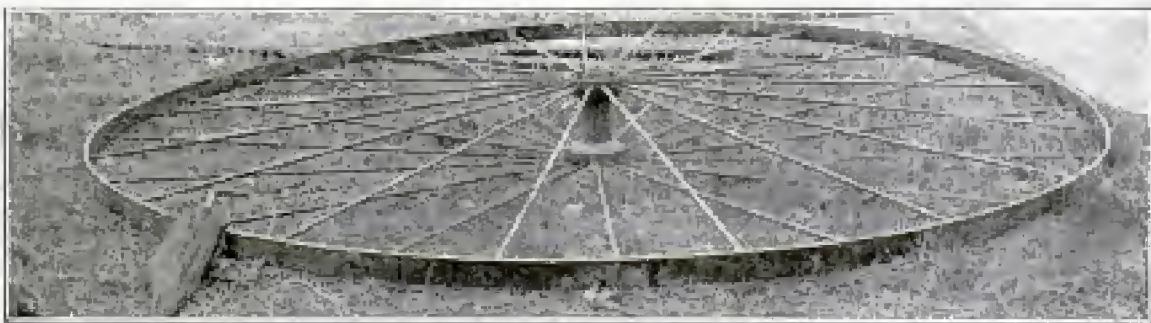
This elephant, which looks like the real article at first glance, is a novel air-filled balloon, shown at one of the recent airship exhibitions in London, Eng.

A Chicago street railway manager proposes to place uniformed newsboys on the pay-as-you-enter cars to put an end to the present brand of newsboys who jump wildly into cars during rush hours.



CONCRETE RAILWAY STATION

This concrete interurban station was practically cast in one piece, following out the idea of Edison and his \$1,000 concrete dwelling. The building is 40 ft. square and has but very little reinforcement.



This Wheel Failed Because Improperly Planned

AUTOMATIC REEL FOR OCEAN CABLEWAY

Makes Life-Saving at Sea Possible with Breeches Buoy

By the use of an automatic reel, which will maintain a uniform tension on an elevated line or hawser and yet permit its length to vary as the motion of the ships demands, a life-saving cableway and breeches buoy has been made practicable for use on ships.

In fact, it has solved the problem so well that the first ship to be so equipped is a U. S. government revenue cutter now under construction in response to the demand for better life-saving facilities on some parts of the Pacific coast. The cutter will be stationed at Neah bay, 5 miles from Cape Flattery. She will be 150 ft. in length, and is to cost \$190,000.

The function of the automatic reel is to pay out the cable without jerks under tension as the ships separate, and wind it in as rapidly as they approach. It must permit the breeches buoy to be operated as close as 300 ft. or as far distant as 1,000 ft., should it be necessary. The reel will have a maximum in-pulling power of 2,000 lb., which may be reduced at will, and will wind in the hawser at the rate of 1,000 ft. per minute, which is believed to be far in excess of requirements.

The rescued persons will be landed on the deck of the cutter by the same hauling-down device that has been so successfully employed in coaling at sea. In many trials, whether the sea has been rough or smooth, the practicability of the device has been proven.

WHEELS TOO LARGE FOR MATERIAL USED

These large wheels, 10 ft. in diameter, were intended to be used to straddle a ditch and lower 12-in. cast-iron gas pipes into place, but after completion it was found impossible to get the rims true. The spokes are made of $\frac{1}{2}$ -in. drawn steel. The fact that the rims were only $\frac{1}{2}$ in. by 3 in. and the hub only 12-in. long probably accounted for the impossibility of truing the rims.

CHIMNEY OF COBBLESTONE AND BRICK

The chimney of this artistic looking cottage was designed to harmonize with the other parts of the house. The foundation is of cobble or field stone. A chimney of this size built entirely of the same material would look too heavy for the shingled upper part, so the chimney was built of red brick with cobble stones interspersed.



A Freak Chimney

TRAVELING SLING FOR INSPECTING WIRES

By the use of a simply devised trolley seat this man works himself for miles along covered bunches of telephone wires, high above the heads of the crowds who watch him from the



Getting up in the World

streets. His task is to travel along the entire length of such lines, searching for breaks in the tube and making repairs.

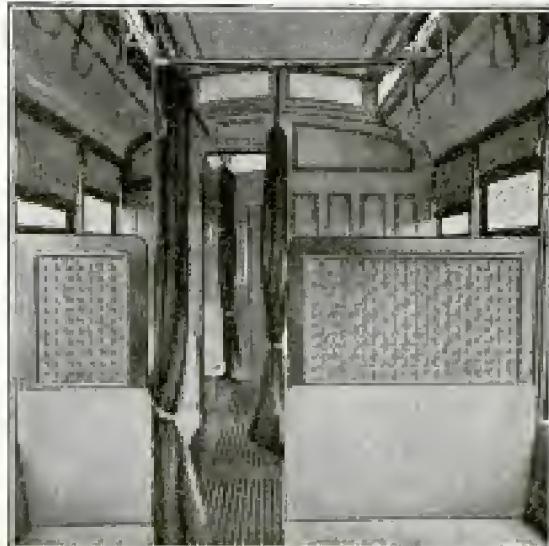
DIRIGIBLE BALLOON IN TWO PARTS

With the idea of overcoming the lack of stability generally found in dirigible balloons of the "Patrie" type, a French aeronaut has constructed a novel dirigible balloon, divided into two equal parts, rendered rigid by a metal carcass and communicating by means of four tubes. The propeller, its two arms describing a circle of larger diameter than that of the balloon, rotates on a central shaft which is fastened to a frame between the two parts. With the usual type of dirigible balloon the propellers are carried beneath

and in front of the envelope, where high winds interfere with their efficiency.

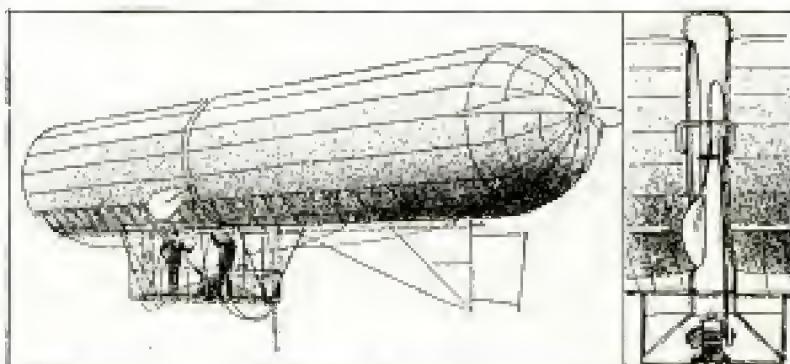
COMPARTMENT STREET CARS NECESSARY IN TURKEY

In Turkey, where the customs, especially those concerning the privileges accorded to women, differ so radically from the customs of more advanced nations, it becomes necessary to alter in one way or another every modern innovation installed. In the electrification of the street railway in Salonica, a

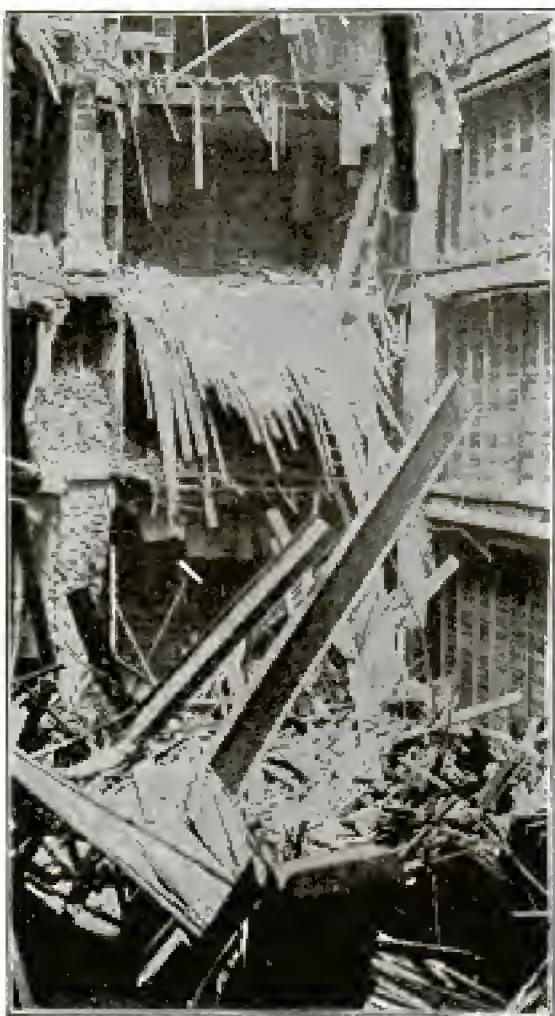


Courtesy Brill's Magazine
Turkish Street Car

Turkish city of 60,000 inhabitants, specially designed street cars had to be built by an American firm before women were allowed to ride. These



cars are divided into first and second-class compartments, and each seat has a curtain, so that the moment a woman enters she can hide herself from sight.



SPRINKLING TANK WRECKS BUILDING

In cutting a large connecting doorway through a dividing wall at the first floor of a 7-story building, no account was taken of the great weight of a sprinkler system reservoir supported by two steel beams resting on the top of the wall directly over the opening being made. As a result the wall collapsed, precipitating the tank and its contents from the roof to the basement, completely wrecking a portion of the building. Fortunately, the work was being done after business hours and no loss of life occurred.

Visual proof that the earth moves is being made at Columbia university by suspending a 91-ft. pendulum from the dome of St. Paul's chapel. As the earth turns one way the pendulum will

swing out the other, its plane of oscillation shifting in the same direction as the sun.

RESCUED AFTER BEING ENTOMBED 1,000 FT. UNDERGROUND FOR 45 DAYS

The three miners who were entombed on Dec. 4 in the narrow pump station at the 1,000-ft. level of the Alpha shaft of the Kimberly mine, Ely, Nev., were at last rescued on the night of Jan. 18, after being buried 45 days; 28 days longer than any person has ever been so entombed and lived to describe the sensation. The horror lived through the passing of the 1,080 hours that intervened between the accident and the rescue can never be fitly described. Each hour seemed a day to the men entombed and but a minute to the rescuers.

Thousands of tons of earth and fallen timbers had to be cleared away, and rescue gangs worked day and night, advancing less than 10 ft. some days, until victory was won and they gathered into their arms the three men so miraculously saved.

A 6-in. pipe through which water had been pumped from the mine was the means of preserving their lives. Through it food and water were lowered in iron bottles made of short lengths of 2½-in. pipes. Air was forced down the same pipe. The telephone was not injured and by it they were able to make their wants known.

THE NEW YORK TO PARIS AUTOMOBILE RACE

Preparations have been completed by well-known French autoists for the polar automobile race which is to start from Times square, New York, and end some time during the coming summer in Paris, after a run across the ice fields of Alaska and Siberia.

The feasibility of the run, with its many possibilities of accidents and disaster, is in no way doubted by the French. Authorities upon conditions

in Alaska and Siberia have declared their belief that a successful run is possible, and that some of the contestants ought surely to get through.

Among the French machines ready for the race is the automobile which will be driven by Hansen, the Norwegian engineer who was sent in search of the ill-fated André. This machine is provided with a powerful windlass for use in case it gets into a bad position. Rope tackle will also be carried for the purpose of hoisting or lowering the machine over steep places. A number of the contestants expect to economize in fuel by hoisting a sail where conditions make this means of propulsion possible.

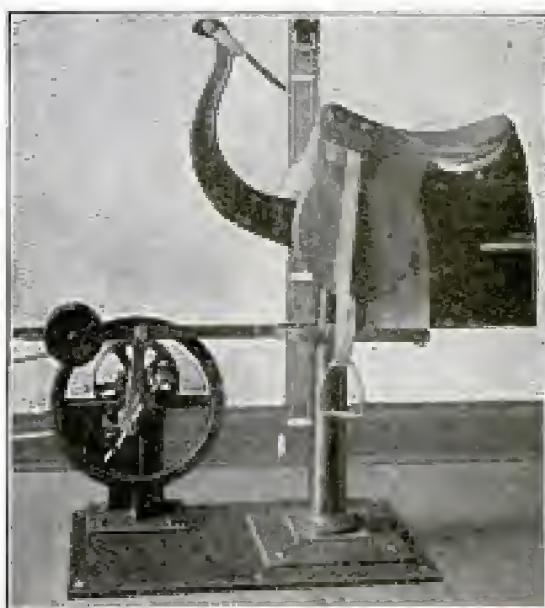
STEEL SHAFT CUT BY QUARTZ SAND

The deep grooves in this large $\frac{7}{8}$ -in. steel shaft were caused by the action of quartz sand in the water of the Carbon river, a glacial stream of Mt. Tacoma. The shaft was connected to the wheel of a low-pressure turbine engine that supplied electrical power to a coal

mine. The worn part passed through a gland and the sand lodging in the packing material gradually ground the steel away.

AN ELECTRICAL HORSE

In this illustration is shown one of the queerest steeds that ever supported a saddle. It is nothing more or less



Stands Without Hitching

than an exerciser operated by an electric motor, on which its owner is able to enjoy a canter of long or short duration at any time of the day, without leaving the comfort and warmth of his office.

Mounting the "steed," the electric current is turned on and the ride begins, the teetering motion being precisely the same as that of a horse in action. Any desired gait can be obtained by merely adjusting a screw. A counter weight permits adjustment of the mechanism to accommodate any weight.

Although the device is being used to a great extent in Germany for training cavalrymen, this is one of the first to be imported to this country. For the training of new beginners in the art of horseback riding it is considered excellent.



Sand Cuts Steel

CAR FALLS HALF OVER ELEVATED STRUCTURE

A motorman on an elevated railway lost control of his car and it ran half



Crib Work to Raise Car

over the end of the structure, balancing itself partly in the air. The fact that the trucks carrying the heavy motors fell to the ground, thus relieving the front end of the car from this weight, was all that prevented it from falling to the ground. The car was lifted back to the tracks by building a cribwork of ties under the overhanging end and using screw jacks.

LARGEST AND STRONGEST VAULT IN THE WORLD

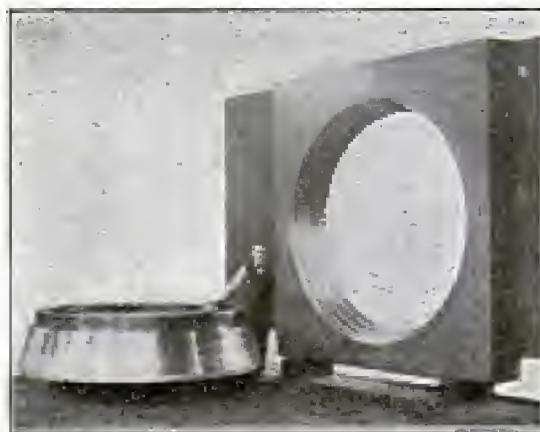
This enormous armor-plate vault, the largest in the world, is to be filled with strong boxes and rented to the patrons of the Carnegie Safe Deposit Co. in New York. Comparatively a new development in vault building, the use of warship armor plate has become a factor which in many respects is revolutionizing such construction. Many advantages are claimed for armor plate, the most important of which are that it is absolutely fire, burglar and earthquake proof.

This vault is built in two stories, with a connecting passage between them carrying an elevator and stairway. The lower story is $9\frac{1}{2}$ ft. high,

106 ft. long and 30 ft. wide. The whole structure weighs 1,200 tons. The steel plates are 4-in. armor plate, of the same kind furnished the government for war vessels. Except for the doors, the walls are free from openings of any kind. The plates are dovetailed together in such a way as to make separation impossible except from the inside, and the entire vault is incased in a 16-in. coating of concrete.

There are no holes through the doors for the locking mechanism, and the automatic time locks are the sole means of opening the vaults after they have once been locked. For each of the three doors there are four clocks. All of these would have to fail simultaneously to make an accidental permanent locking possible. The clocks are set for the hour of opening and the vault doors closed. When the hour arrives they automatically throw the bolt-operating mechanism into action and the doors are released so that they can be opened from the outside.

The large circular vault door, shown in the illustration, is large enough to admit a horse and carriage, or an automobile, being 9 ft. in diameter. Its massiveness, however, would prevent the admittance of anything smaller and less forceful than the projectile of a



Courtesy Bethlehem Steel Co.
The Big Steel Door

14-in. gun, when closed. The exact cost of the vault has not been made public, but it is understood that the figure is close to \$500,000.



FUNERAL PROCESSION ON SKATES

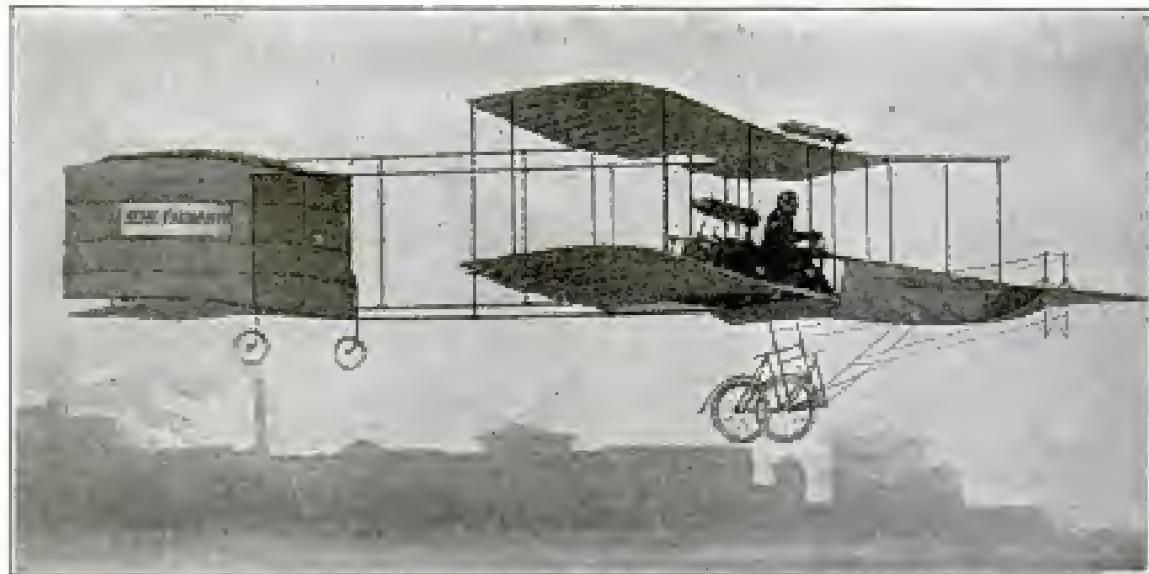
Among the Wends, a remnant of the ancient Slavonic race inhabiting the Spreewald, a region enclosed by an arm of the Spree river, about 50 miles south of Berlin, are seen the most curious funeral processions of the civilized world. As in Holland the thoroughfares are waterways. In the winter time, when these are frozen over, funeral processions pass along the ice on skates. The coffin is carried on a sledge, drawn by six mourners on skates. The immediate relatives of the dead, men and women, alike, skate along behind the coffin, surrounded by their friends. The women carry a Bible in one hand and wear the ancient national costume.

HOW THE AIRSHIP "LA PATRIE" ESCAPED

France has not yet recovered from the stunning blow delivered by the element of the air when "La Patrie," the pride of all loyal Frenchmen, broke loose from the hundreds of restraining hands that tried to hold it, and in the course of a few short hours scattered parts of itself over the peat bogs of Ireland and the waters of the Atlantic.

France's misery is not all in the fact that the airship was valued at \$60,000, nor altogether because "La Patrie" was depended upon to gain the "blue ribbon" of the atmosphere for France, but because the wrecking of the great airship was the result of such a matter-of-fact procedure as the entanglement of the chief mechanic's long, flowing coat with the distribution gears. Little things have caused great disasters in the world's history. A little rain on the field of Waterloo resulted in Napoleon's fall, and a long coat was the primary cause of "La Patrie's" loss.

The ship was over Toul and had only two miles to travel to complete its 150-mile journey from Paris to Verdun when the accident occurred. The engine was fitted with double ignition, but as distribution was from the same shaft, the accident put both out of commission. It would have been easy to drag the airship the remaining two miles to its shed at Verdun, but the pilot decided to repair the damage then and there. All night the airship was held to the ground by 800 troopers. A squall came up and blew itself into a hurricane. By some oversight the valve cord, which if pulled by any weight would have allowed the gas to escape from the bag, had not been at-



Farman's French Aeroplane--First to Make Long Flight

tached to ballast, and when the airship was at last torn away from the troops it could not be located.

OLD POSTS AND NEW

Side by side in this illustration are shown the new and the old in poles



Steel Displaces Wood

for carrying heavily charged wires. The steel post is made of three pieces of U-shaped steel, held apart by castings and triangular hoops, no holes being drilled. A solid concrete base is cast around the steel after the pole is set in position.

FRENCH AERONAUT WINS \$10,000 PRIZE

Henry Farman, the French aeronaut, who for the past few months has been startling France with his wonderful flights in an aeroplane, won the Deutsche-Archdeacon prize of \$10,000 in January by making a circular kilometer, which is a little more than a circular half-mile, without his machine touching the ground.

With a preliminary run of 100 yd. over the ground the aeroplane rose to a height of 15 ft., then with outstretched wings it sailed away across the fields at a height of from 25 to 35 ft. at a speed of 24 miles an hour. It reached the outer mark, described a graceful circle, and went sailing home on an even keel. It is estimated that with the curve described by Farman the aeroplane covered a distance of nearly a mile. The motor used has 8 cylinders and developed 50 hp. It weighed 176 lb.

Count Henri de la Vaulx, Farman's most feared competitor for the prize, met with serious accidents in his first trials, which placed him out of the contest. One of the wings of his aeroplane bent at the shoulder and the great bird-like machine shot to earth at a tremendous speed, seriously injuring its owner and completely wrecking itself.

TWO ELEVATORS TO RUN IN SAME SHAFT

Safety Devices Make Collisions Impossible—Floor Space Worth Thousands Saved

An invention which, it is asserted, will revolutionize elevator service in skyscraper buildings, causing a saving of space worth from \$25,000 to \$100,000 a year in rents, according to the size of the building and the number of elevators necessary, will be installed soon in two large skyscraper buildings, one in Chicago and the other in New York, by a well-known architect.

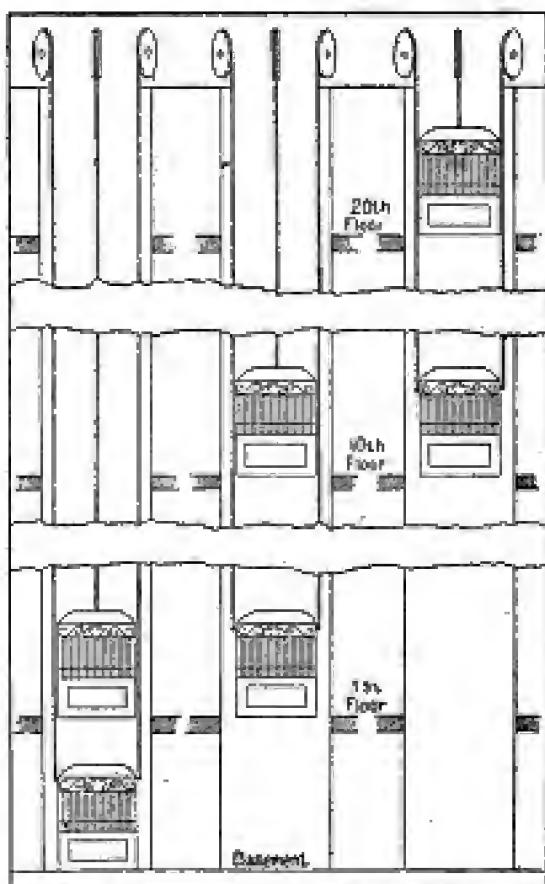
The key to the invention is the operation of two elevators in one shaft, a feat which sounds impossible at first thought, but which is simple and practical. Take, for instance, a building of 20 stories. One-half the elevators are run as express and the other half as locals; each car having a separate shaft. The new system cuts this elevator space exactly in half by running two cars in each shaft.

The arrangement is as follows: The express elevator is at the first floor, loading; the local elevator directly underneath it in the basement. As soon as the express elevator is loaded it leaves and makes its first stop at the tenth floor. Meanwhile the local elevator rises to the first floor and loads. The local leaves the first floor at the same time the express leaves the tenth. They both travel up ten stories serving locally, then both travel down ten stories serving locally. While the express elevator is descending from the tenth floor to the first the local elevator unloads at the first floor and drops into the basement. The express elevator then unloads at the first floor and the same process is repeated.

The upper elevator is never delayed. The lower elevator is only delayed while the upper elevator is loading or unloading at the first floor, which on a two-minute schedule would be about 20 seconds. The upper elevator is lifted by central cables and the lower by side cables. Not only will the elevators be protect-

ed by the ordinary means, but they have mechanism, simple and effective, which when the cars get within a pre-determined distance of each other slows them down and at a closer point absolutely stops them.

The saving of floor area is great. Take, for instance, a modern skyscraper 20 stories high, having 20 elevators. Each shaft, with hall serving it, occupies 160 sq. ft. per floor. One-half of



Courtesy Jarvis Hunt, Arch.

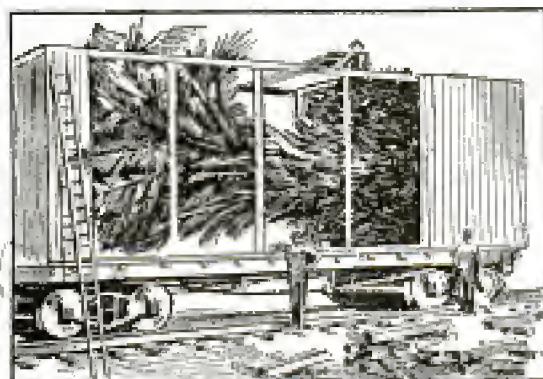
Plan of Double Elevator

the elevator shafts and hall space is done away with, which gives an additional renting area on each floor of 1,600 sq. ft. Multiply this by 20, the number of floors, and the amount of renting area saved is 32,000 sq. ft. Such space is worth \$3 per square foot yearly rental, which means an additional rental income of \$64,000.

It is estimated that the value of the electrical and auxiliary manufactures in the United States for the year 1907 was \$315,900,000.

LARGEST GROWING PLANT EVER MOVED

At the cost of a small fortune a giant palm, 50 ft. high when in the ground, 20 ft. in circumference at the base, and

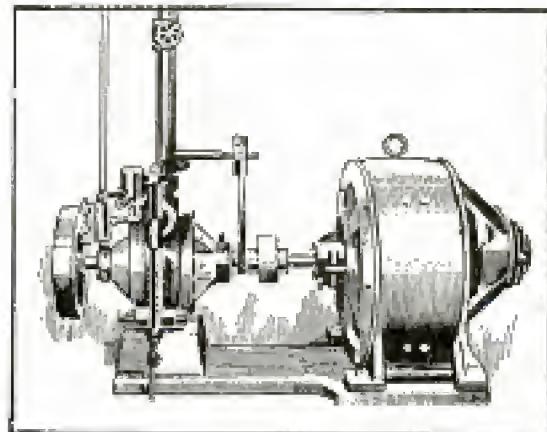


Crating the Big Palm

weighing 40 tons in its case, has been moved from the W. J. Dingee estate at Redwood City, Cal., to Santa Cruz. The palm was first cut out of the earth without disturbing the dirt around the roots more than absolutely necessary, as a large frame, or box, resembling the uncompleted first story of a large frame house, was built around dirt, roots and trunk. The palm was slowly moved to the railroad tracks as a house is moved, on rollers, and lifted to the flat-cars with powerful derricks.

DIRECT-COUPLED ROTARY STEAM ENGINE

This rotary steam engine, direct-coupled to a 15-hp. dynamo, is the



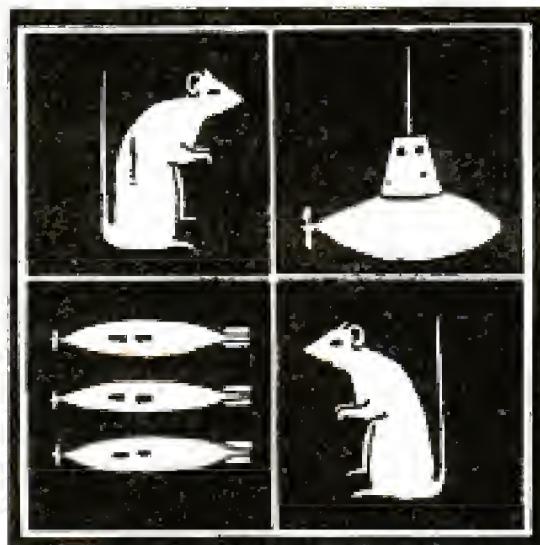
New Steam Rotary

next thing to a turbine, with the added advantage that it is reversible and has not one ounce of back pressure. The assembling of its parts is such that it has no dead center and will start at any point in either direction. It will operate with steam from one pound up to as high a pressure as a modern boiler can stand.

On vessels it can be used for many purposes, such as operating steam steering gear, steam capstans, windlasses, hoisting machines, dynamos for electric lighting, ventilating fans, circulating pumps, bilge pumps, etc.

MICE ON SUBMARINE ENSIGN

On the new flag designed for the submarine branch of the British navy mice have for the first time in the history of



New Submarine Flag

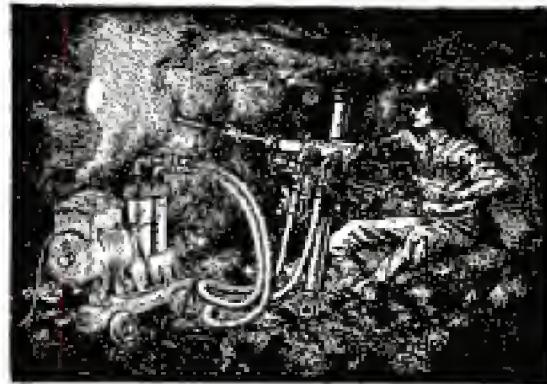
the civilized world been placed on an emblem which typifies honor, strength and craftiness. The last of these is certainly appropriate, as the submarine boat, like the mouse, craftily burrows to destroy.

The flag measures 18 ft. by 12 ft., and has a background in three vertical sections colored red, blue and yellow. In the center is the black shield or design shown in the illustration. The shield is divided into four parts, two of which are occupied by a submarine and three torpedoes. In each of the two remaining quarters is a white mouse.

The uninitiated would say at once that mice have been so distinguished because they, like the submarine, craftily burrow underneath an enemy to destroy. But this is the least important of two reasons. The real consideration is the fact that white mice are among the most important members of a submarine boat crew, their intense dislike of the odor of gasoline making them quick and unerring alarms. The moment a gasoline tank commences leaking the loud squeals of these diminutive members of the British navy notify the human members of the impending danger, thus preventing disastrous explosions.

MINING WITH ELECTRIC AIR-DRILL

The electric air-drill shown in this illustration has proven itself the most successful solution of the problem of drilling rock in mines by electric power.



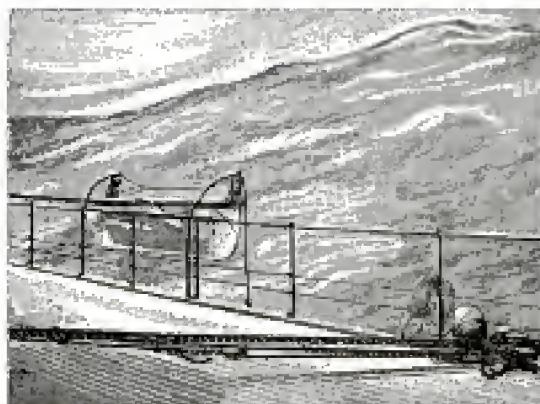
Electric Air-Drill

The drill is propelled by compressed air produced by a portable electrically-driven compressor. The entire apparatus is brought down to such a small compass that every part of it is really portable, a great advance over the ordinary air-drill, with its necessary air compressor plant and pipe lines.

PACIFIC FLEET IN HIGH SEAS

When the battleship fleet put out of Hampton Roads there was a strong wind blowing, which increased to a gale

lasting several days. One of the sailors took a photograph the third day out, from the main deck of the "New York," from which this illustration was drawn. The distance from the small boat hanging from the davits to



The Waves Ran High

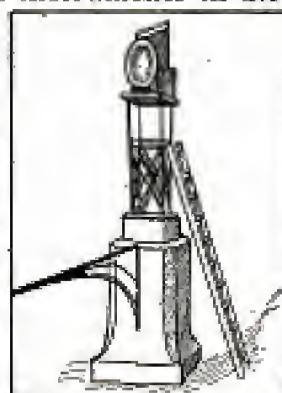
the water line is 25 ft., showing the waves which looked "mountain high" to the new men.

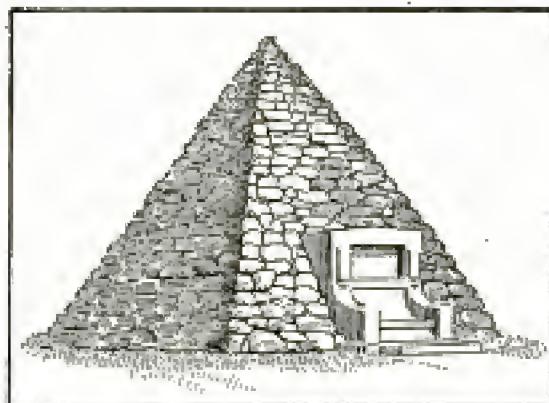
DUEL BENEATH THE SEA

Six miles off the Florida coast, 57 ft. under the surface, Nicholas Andreas and John Bastoni, Greek sponge divers, fought desperately with sponge hooks for possession of a big sponge. Both received painful wounds, but when Andreas later attempted to institute prosecution he found that no court had jurisdiction over the bottom of the ocean.

SAMPLING DUST FOR ANALYSIS

The city authorities of Berlin have set up a number of instruments in different parts of the city to collect samples of dust for chemical analysis. The result of this analysis determines the localities where dust is most dangerous to health. Steps are then taken to eliminate it as far as possible, which in Germany means much.





PYRAMID MONUMENT TO A PRESIDENT

Of all the monuments erected to the memory of the presidents of the United States, one of the most interesting is the pyramid of native stones which has just been placed on a lonely mountain side at Stony Batter, Pennsylvania, to mark the log-cabin birthplace of James Buchanan, the only president ever given to the country by that state.

The monument consists of a pyramid of native stone, set in cement, 31 ft. high and 38 ft. square at the base. Upon one side is a granite tablet with an appropriate inscription. The monument was erected with money left for that purpose by the will of President Buchanan's niece.

ASPHALT OIL PAVEMENTS

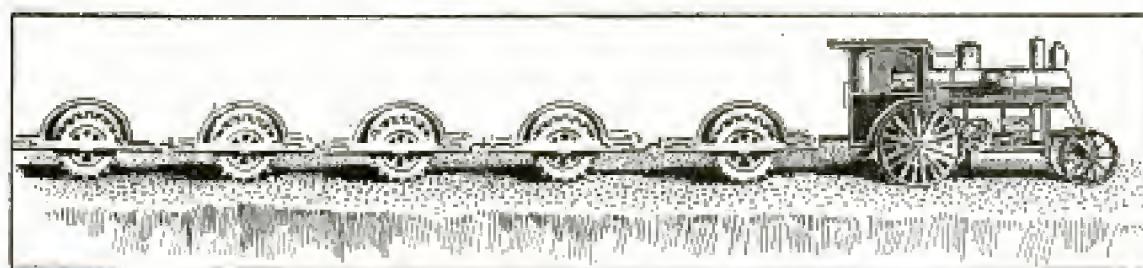
After watching a flock of sheep walk over a newly plowed field a western pavement contractor invented a rolling tamper which is mechanically the same flock of sheep as far as the effect is concerned. After the sheep had passed over the plowed field the soil was so hard that a pick could hardly make an

impression upon it. The rolling tamper accomplishes the same result, and it is due to this fact that the asphalt oil pavements of California are so satisfactory.

The tamper is a huge roller, from the circumference of which project innumerable steel feet. Instead of packing the earth from the surface down, as is the case with other rollers, it packs it from the bottom up. When the roller starts over the plowed road-bed the tampers sink to their hilts. Gradually, as the rollers pass back and forth, the earth grows so hard that the tampers ride entirely upon the surface and fail to make an impression.

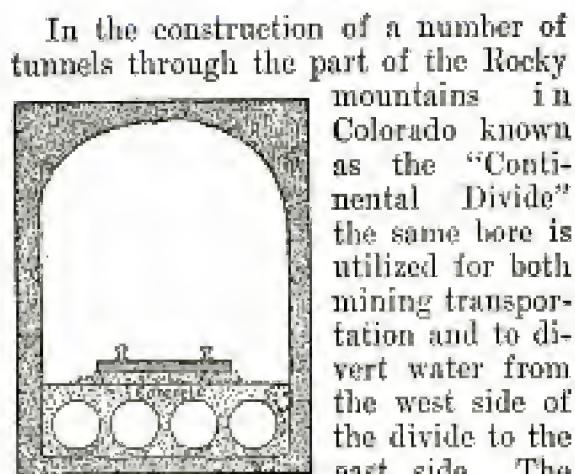
The construction of the asphalt oil pavement is simple, but at the present time the process is practically confined to the far western states, as the crude oil of the eastern states does not contain the desired qualities. California crude oil is usually more than half asphaltum, while the base of the crude oils of eastern states is generally paraffin. In constructing the pavement the roadbed is first plowed up to a depth of about 6 in., sprinkled with water, and tamped for a thickness of 2 in. Oil tank sprinklers are then driven over until one gallon of oil per square yard is distributed. A cultivator next mixes the oil and earth, the roller tamper is run back and forth until no impression can be made, and the operation is completed with a few turns of a common road roller.

The first Chinese School of Forestry has just been opened at Mukden. The Chinese Empire paid no attention in the past to the destruction of its forests.



Road Machine Suggested by Flock of Sheep

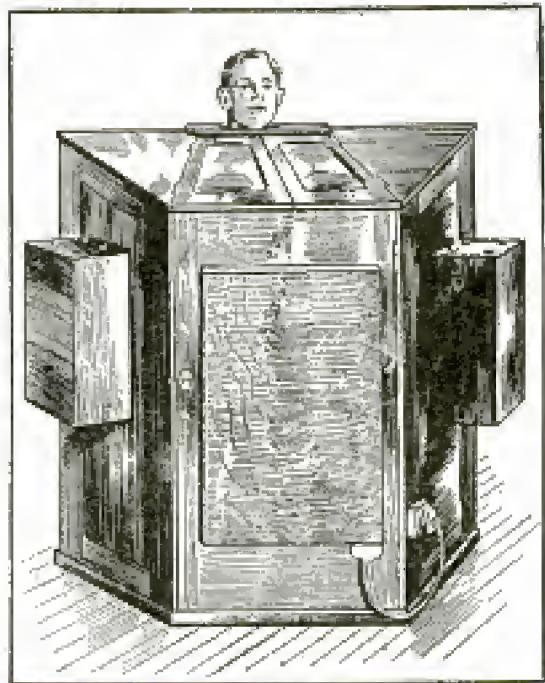
TUNNEL FOR JOINT USE OF WATER MAINS AND RAILWAY



In the construction of a number of tunnels through the part of the Rocky mountains in Colorado known as the "Continental Divide" the same bore is utilized for both mining transportation and to divert water from the west side of the divide to the east side. The water mains are a little smaller than generally used, but are four in number, placed in a bed of concrete underneath the railway track.

ELECTRIC LIGHT BATH CABINET

Every kind of a bath from a mud to an alcohol bath is being given by physicians in different parts of the world as the best cure for a multitude of troubles. Among these baths electricity in the form of electric rays is receiving recognition in the medical world. The accompanying illustration shows an

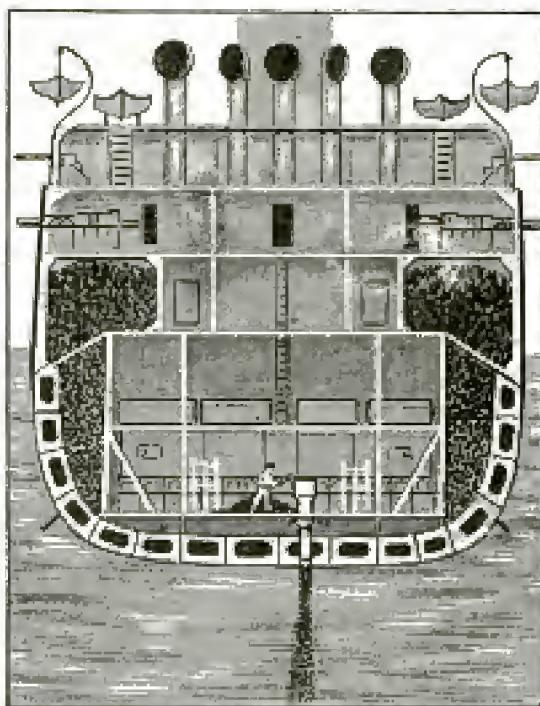


The Light Cure

electric light bath cabinet equipped with incandescent lamps.

UNDERLINE ASH EXPELLER

A new way of disposing of the large amount of ashes and clinkers which materialize every day in the stoke-hole of a ship has been found in this machine, which expels the ashes and clinkers straight down through the bottom of the ship instead of from the side. The latter method has many disadvantages, such as the necessity of study-



Shoots the Ashes Out

ing the weather conditions on deck, working ashes up on the leeward side of the vessel, or holding the ashes below until the weather changes.

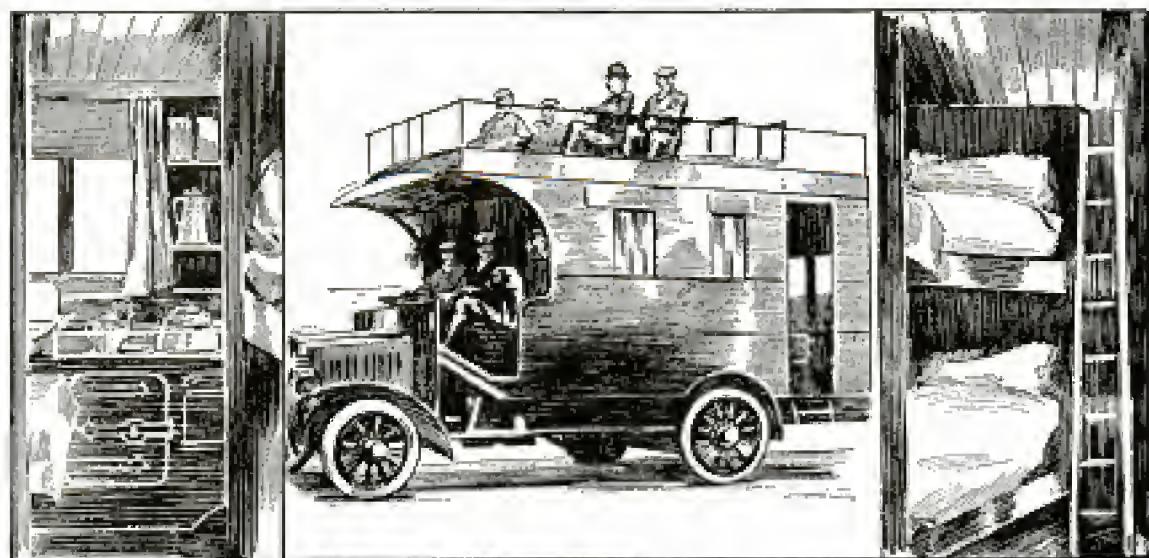
The underline expeller, which is driven by air motor, eliminates all these disadvantages. The machine is absolutely silent in its workings, all its parts are at all times accessible for examination, and the ashes are projected with sufficient velocity to carry them deep enough to clear all suction. It is also claimed that there is absolutely no scouring action of ashes on the hull, or possibility of their coming in contact with the stern tube.

MISSISSIPPI RIVER JETTIES

The two immense jetties at the mouth of the Southwest Pass of the Mississippi river, just completed, have succeeded in giving the southern states

ENGLISH CARAVAN CAR

Our European manufacturers continue to maintain the lead with new ideas in automobile construction. House cars, or caravans, as they call



Kitchen

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Caravan Car

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Bunks

a deep and always accessible harbor by opening the 100 and 200 ft. depths of the Mississippi river to the largest ships afloat.

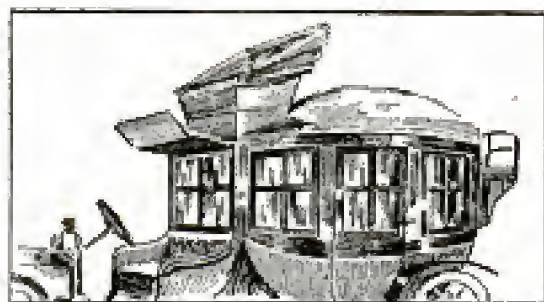
The jetties were begun four years ago and have cost \$2,700,000. They are nearly parallel walls, one three and the other four miles long, lying over half a mile apart and built in shoal water at the juncture of the pass with the Gulf of Mexico. The swift currents which they produce, aided by dredging, caused a tremendous washing out of river bottom even before completion, making 50 to 85 ft. of water in some places, where at the beginning of the work the depth was but little over a man's head.

The construction of the jetties was carried out under many difficulties, among which was the necessity of bringing the material from distances ranging from 100 to 500 miles. The completed walls have no foundation, but rely for stability upon their extremely broad bases, 100 to 150 ft. wide at the bottom. The capping is a concrete sea-wall $4\frac{1}{2}$ ft. high, and is the only portion not submerged.

them over there, are rapidly passing from experiment to practical use. The car illustrated contains a completely equipped kitchen and sleeping berths for six persons, and Motor of London says the owner, Mr. Fletcher, with friends, made a 4,000-mile tour in it during the past few months.

The only delay from failure of engine was one of five minutes when a small valve spring broke.

The kitchen is placed at the rear, where odors of cooking do not reach the passengers. The outside seats follow the lines of the time-honored London bus.

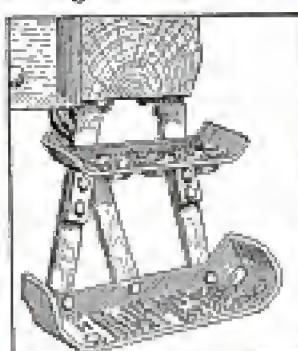


French Coaching Auto

Another type of outside-seat car was displayed at the recent motor car show in Paris.

LIFE-SAVING TENDER STEP

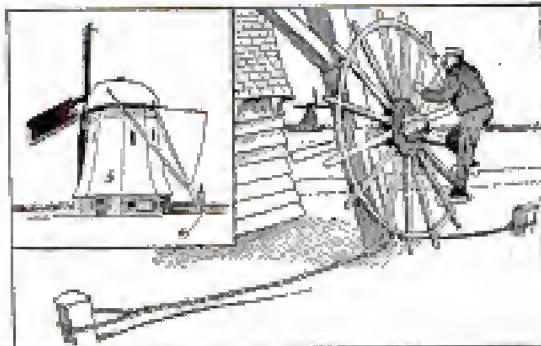
Many serious accidents have occurred to engineers and firemen when climbing off and on to locomotives and tenders because the steps were covered with ice and slush. This step was adopted by the Canadian Pacific railway to make the danger of such accidents as small as possible. The 2-in. holes in the step allow the snow and ice to fall through, while the projections or lugs afford a secure foothold. The high flanges prevent the feet from slipping over the ends.



as small as possible. The 2-in. holes in the step allow the snow and ice to fall through, while the projections or lugs afford a secure foothold. The high flanges prevent the feet from slipping over the ends.

STARTING A DUTCH WINDMILL

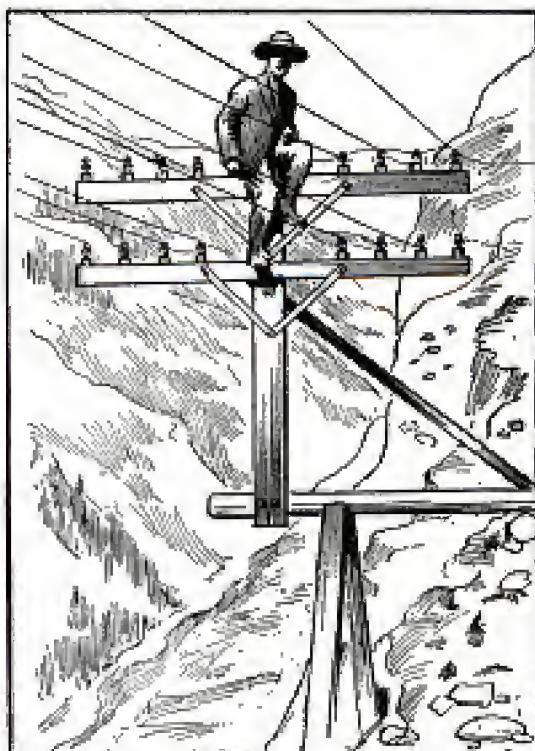
The simple Dutch millers, ignoring the advancement of the years in mechanical appliances, still cling to the simple devices used by their fathers and grandfathers. In this illustration is shown a miller starting one of the windmills that thickly dot the rim of the Zuyder Zee. The immense wings, with an expanse like the sail of a ship, must be swung out to catch the wind. To accomplish this a wheel, resembling the steering wheel of a ship, is used. The miller places his feet upon the spokes and diligently treads until the rope, attached to a brake-beam, releases the wings and starts them swinging lazily in the wind.



Seen in Holland

LINE WORK 800 FT. ABOVE CANON

Along this mountainous trail near Ouray, Colo., the telephone poles were set out on a trestle to avoid interfer-



800 Ft. to Rock Bottom

ence with passing teams. One of the linemen who did the work is seen perched on the crosspiece 800 ft. above the bottom of the canon. The illustration is redrawn from a photograph furnished by the courtesy of the Colorado Telephone Company.

FISH INSPECT TORPEDOES

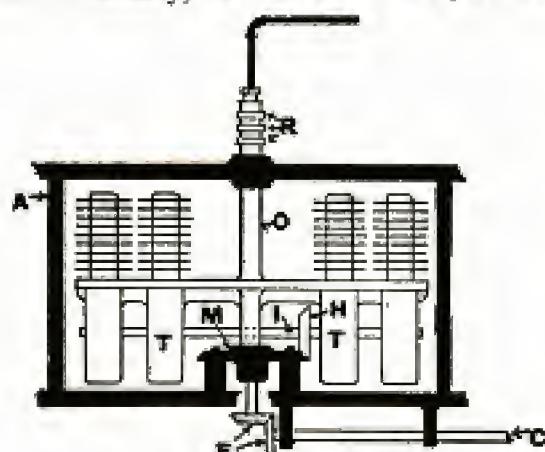
The curiosity of fish is in no way better demonstrated than by watching their antics when torpedo practice is in progress. Recently a school of big fish swam up the bay near Sag Harbor, L. I., while a torpedo boat was firing at a target, and began to investigate. The result was a great number of mangled fish and a noticeable zig-zagging of the torpedoes before they struck the target. A shark at another practice tried conclusions with a torpedo, with similar effect on the shark.

GYROSCOPIC ENGINES FOR AEROPLANES

By Prof. George H. Morse

Department of Electrical Engineering, University of Nebraska

At first thought the use of gyroscopes to steady an aeroplane while in flight appears chimerical. Yet when one reflects that the boomerang depends for its stability entirely upon its rapid rotation the principle seems worthy of some consideration. Even the ordinary playing card, in the hands of an expert, may be sent whirling and flying accurately to a mark at a distance of a hundred feet or more. While it is out of the question to load an aeroplane with a gyroscope of sufficient mass to be of utility, it occurs to the writer



Details of Proposed Mechanism

that invention and mechanical evolution may ultimately make available for gyroscopic action the mass of the propelling motors themselves, even including necessary fuel and rations.

The arrangement shown in the accompanying drawing is intended merely as a suggestion leaning toward a possible solution of the problem. In this drawing the members shown in solid black, as A, are stationary parts, integral with the framework of the aeroplane. The parts shown in outline all revolve. TT is a four-cylinder gasoline engine, I being the main engine shaft. The shaft I carries a bevel pinion, H, which meshes with a stationary bevel gear, M. The weight of the engine is supported by the vertical shaft, O, which gets its bearing upon the face of

gear M. The shaft O extends through the gear M, and carries a bevel pinion which is one of a pair serving to supply motion to the propeller shaft, C. A hole is provided in the lower part of shaft O, through which the engine shaft I passes. The upper end of O may be made hollow where it passes through the upper bearing. Electric wires may thus be led from the insulated slip rings, R, through shaft O, to various electro-magnetic controlling apparatus on the engine cylinders. Fuel may also be sent from a stationary retainer to the engine by means of the opening in the end of O. Of course, the engine unit here shown would need to be operated in connection with a similar unit revolving in the opposite direction in order that the reactions on the frame of the aeroplane be balanced. The engine arranged as described is virtually its own flywheel. In order to reduce the retarding effects of the air the revolving engine should be incased in a large vertical cylinder, only such air currents being permitted to exist about the engine cylinders as are necessary to keep them cool.

It should be possible also to apply the principle I have described to light water craft with the effect of keeping them on even keels in rough water.

FRENCH BARREL MOTOR TRUCK

A specially constructed motor truck for hauling casks of wine and other liquids is coming into general use in Paris. It has been found the load is



Cannot Roll Off

carried better in the manner shown in the illustration than when the casks are set up on end.

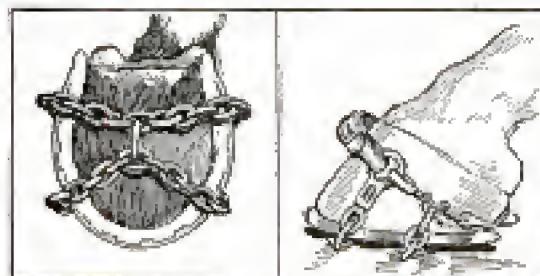
BOILER HURLED LONG DISTANCE BY EXPLOSION

In a recent boiler explosion in the Kern River oil fields of California a horizontal tubular boiler was thrown a distance of 1,220 ft., an accident unusual for a boiler of this description, although happening often to vertical boilers.

The explosion completely wrecked the boiler house and hurled the boiler across two gulches and over the top of a 74-ft. derrick which stood in the direct line of its flight. The boiler was one of three 70-hp. cylindrical return-flue boilers, weighing 5 tons each.

EMERGENCY OVERSHOES FOR HORSES

In large cities, like Chicago and New York, icy asphalt pavements cause the death of hundreds of horses every winter. Many styles and shapes of shoes are now being introduced in an endeavor

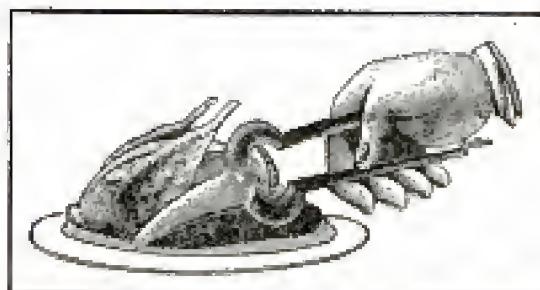


Ice Creepers for Horses

or to stop such accidents, one of the most promising of which is the emergency shoe, here shown. It consists of a chain "tread," which can be quickly buckled on and as quickly taken off the foot of a horse without the use of tools. It is practically self-adjusting, is strong, cheap and durable.

CARVING FOWL WITH CLIPPERS

The most expert sometimes find carving fowl an awkward task, and many times the first cloud to arise on an otherwise sunshiny matrimonial horizon has been caused by an unsuccessful tussle with a turkey. This pair of



No Skill Required

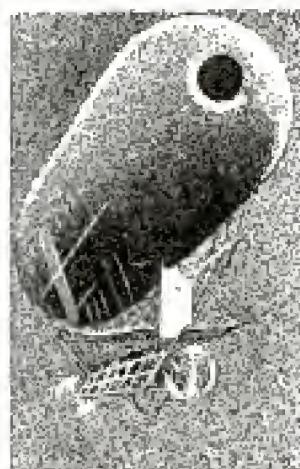
carving shears was devised especially for those who find the talent of carving hard to acquire. The upper blade is a carving knife and the dented lower blade forms a clip. The shears are easy to handle and permit one to successfully attack any part of the fowl.

TO STOP WIRELESS MESSAGES IN WAR TIME

An Austrian electrician has invented a device for destroying wireless messages during times of war. It consists of a revolving tower from which flashes of varying strength are thrown out. By this means all receiving instruments within a wide radius could be so deluged with flashes that the operators would not be able to distinguish messages.

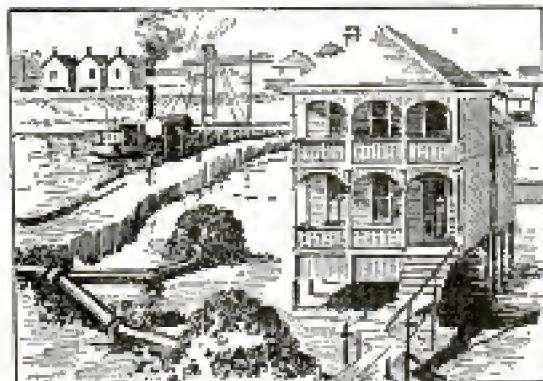
SUGGESTED TYPE OF DIRIGIBLE BALLOON

The dirigible airship is a type suggested by persons enthused with the flying fever, who believe that airships would sail better against the wind if pierced through the center of the envelope by an aluminum tube open at both ends. Their idea is that the air resistance would not be as great as it is with the usual type of dirigible balloon.



RAISING GALVESTON 15 FT.

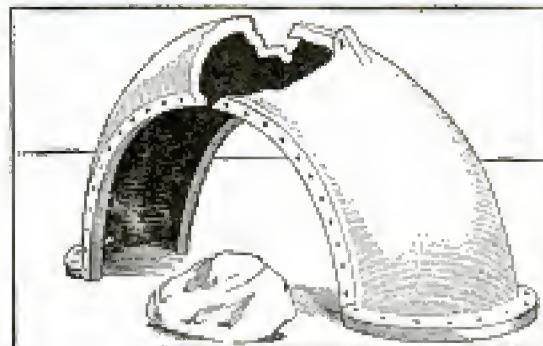
This illustration shows one of the scenes attending the raising of the grade in Galveston, Texas. The house shown in the foreground was raised 15

**Method of Raising**

ft., half of which height has been already filled in. The two large piles of soil are at the ends of two discharge pipes from the big dredge working in the canal.

STONE BOULDER BREAKS DREDGE PUMP

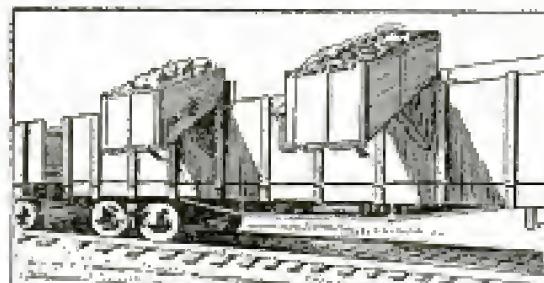
The object shown in this picture is the broken casting of a large centrifugal pump used on a powerful suction dredge. The damage was inflicted by a heavy stone boulder which was sucked in by the dredge with such force

**An Unusual Break**

that it burst the upper casing of the pump. The casing was cast-iron 3 in. thick.

QUICK UNLOADING CAR CHUTE

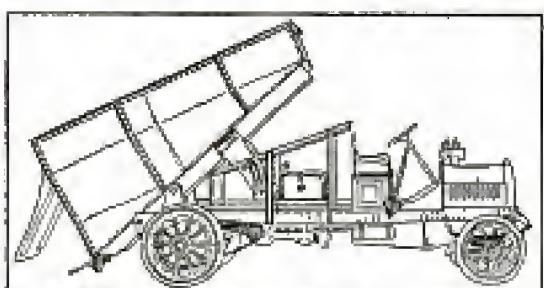
It takes time for a crew of men to unload crushed stone, sand, or other

**Loads in an Instant**

material from a car into waiting wagons. Time means money, therefore the reason for the quick unloading chute in this illustration. The chute is attached to the side of the car and filled by the unloading crew. When a hauling wagon arrives it is driven under the chute, the catch is kicked out, and the wagon box filled in a moment. These chutes are made in different sizes, the medium size holding one cubic yard.

GERMAN AUTOMOBILE COAL WAGON

Automobile coal wagons, the boxes of which are tipped to discharge the coal

**Carries Three Tons**

by means of the 18-hp. gasoline engine which runs the truck, have been introduced in Berlin, Germany. The box, or coal bunker of the wagon, has an inclined bottom, which aids in the discharge of the coal. The truck has a carrying capacity of three tons, and is operated at a normal speed of from 8 to 10 miles an hour.



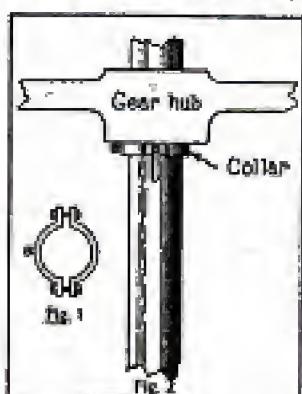
SHOP NOTES



Holding Up a Gear on a Vertical Shaft

The large wheel of a gear drive on a vertical shaft was put on with a key without a set screw, and consequently

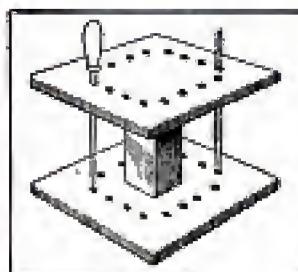
it would keep slipping down on the shaft and had to be raised every three or four weeks. As it was impossible to take it off and fix it, we had a blacksmith make a collar as shown in Fig. 1.



Two pieces of iron about 3 in. long and $\frac{1}{8}$ in. thick, bent to fit the shaft, leaving a space between the ends, were used. A set screw was placed in this collar and two $\frac{1}{2}$ -in. bolts passed through the ends to clamp it on the shaft. The wheel was raised to the proper place and the collar adjusted so the key on the shaft came between the ends of the collar, and the place was marked for the set screw. A small cup was cut in the shaft to receive the set screw. When placed in position and tightened up, no more trouble came from that source.—Contributed by L. F. Groger, Concord, Mich.

How to Make a Tool Stand

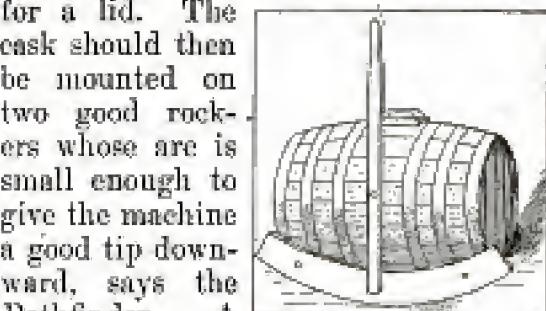
Two boards about 16 in. square are fastened one on each end of a square post or centerpiece. An equal number of holes are drilled in each board to receive the tools as shown. The top board may be a little larger than



the bottom and the holes made to slope toward the center at the bottom. If a handle be placed in the middle of the top board, this device can be used on a bench or floor, as desired.—Contributed by Harold Beecher, Toronto, Canada.

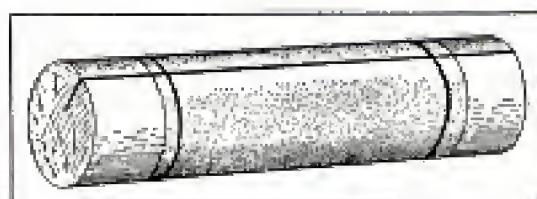
A Home-Made Washing Machine

Secure a good water-tight cask, thoroughly cleanse it and cut a hole for a lid. The cask should then be mounted on two good rockers whose are is small enough to give the machine a good tip downward, says the Pathfinder. A handle is nailed on to one rocker and the machine is ready. Put into the cask the warm washing solution and then follow with the laundry; clap the lid on tight, and begin to rock the machine. The cleansing is accomplished simply by the shock of the laundry and water against the ends of the cask as it tilts back and forth.



A Sandpaper Kink

Turn an ordinary straight spindle and saw a slot in the middle on a bench saw. Place one end or side of the sandpaper in this slot and turn the sheet



Sandpaper Kink

around the spindle. A rubber band is placed on each end to hold the sandpaper in place, says a correspondent in *Woodworkers' Review*. This spindle is placed in an ordinary lathe, with the sandpaper turning in the proper direction, for use in sanding irregular surfaces.

Cutting and Storing Ice

Many farmers go without ice all summer because they think it too hard work to secure it safely packed in some sort of an ice house or shelter. Some who have the houses or sheds fail to harvest a crop on account of the cost for hired help. But the work can be done to advantage with two men if a derrick is used.

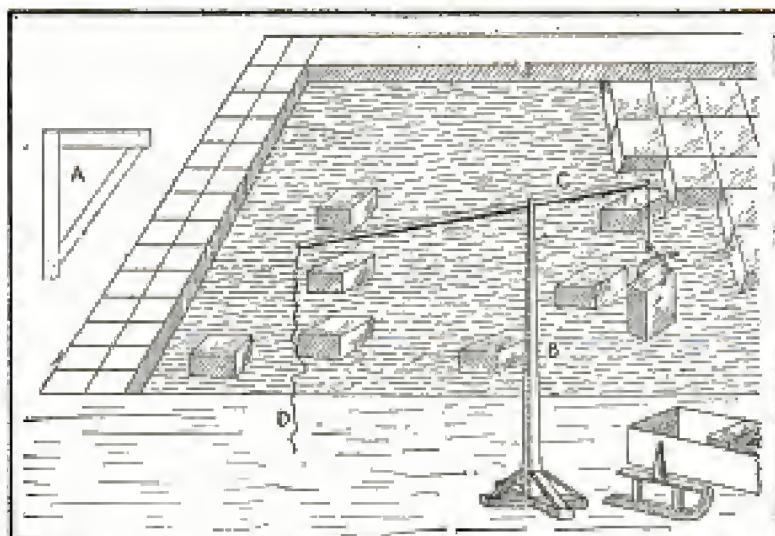
We used a regular crosscut champion tooth saw, detaching one handle therefrom, says a correspondent in *Hoard's Dairymen*. A square was made of two pieces of narrow fence board as shown at A in sketch, with a brace to make it rigid. This, with a 16-ft. 2-in. plank, was used to lay out and mark the squares of ice. The derrick was made by using two strong white oak poles to make the vertical post and the sweep. The vertical post, B, may be cut from any strong piece of lumber, or made up by spiking together two pieces of 2 by 4-in. studding. It should be about 15 ft. long and braced at the base as shown in the sketch. The bottom should be smooth in order to slide freely over the ice. The sweep, C, should be about 16 ft. long, or over, with a rope attached to each end as shown. The sweep is pivoted on top of the vertical post, B, from one-quarter to one-third projecting over to the side, where the ice tongs are attached to the lower end of the rope. The rope, D, at the opposite end allows plenty of leverage to handle and swing

the heavy cakes up and around into the box.

After a lot of cakes have been cut loose from the ice, one man seizes the tongs and gets a cinch on the first one that comes along. The other man pulls down on the rope and elevates the cake very easily. The sketch shows how the work is done, and a load is quickly made ready for hauling to the ice house.

Turning Nuts on Mandrels

A great many persons use a hammer to turn a nut on a mandrel where it is



necessary to have a close fit. In the case of setting a nut on a saw mandrel, if a hammer is used as shown in Fig. 1, the blow would be a good many hundred pounds. The striking force of any falling body is equal to the weight multiplied by the square of its velocity, says *Wood Craft*. A hammer should

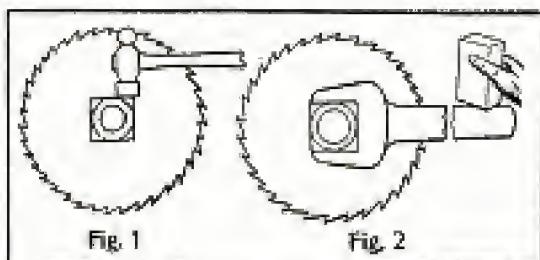


Fig. 1 Fig. 2

Use a Solid End Wrench

never be used to turn a saw mandrel nut. Procure a solid end wrench that will fit the nut closely, put the wrench

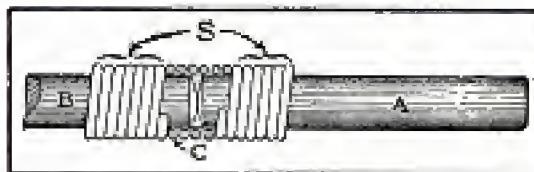
in position as shown in Fig. 2, and strike on the end of the wrench with the hand, or with a bit of wood—almost any block will answer—and the nut will be started quickly.

How to Remove Stumps

A soft wood stump may be removed by boring a large hole, say 1 in., in a downward direction to a depth of 16 or 20 in. Fill this hole with kerosene, and as the oil penetrates the wood fill the hole again. After each filling cork the hole with a wood plug. After a month or two apply fire to the oil in the hole, which will entirely consume the stump.

Flexible Drive for Small Boring Bar

It is sometimes desirable, when using a drill or boring bar, in cases where the bar is used in connection with guide bushings in a fixture to provide a flexible drive in order to avoid any tendency to cramp the bar. The accompanying sketch shows a simple and inexpensive form of universal joint which has been used successfully for driving small boring bars and drills



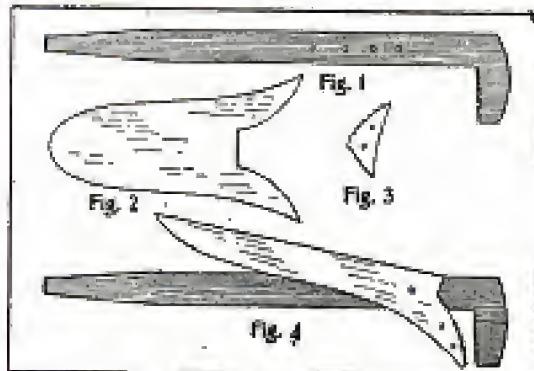
Inexpensive Universal Joint

in cases where the fixture bushings have been more or less out of line with the driving spindle. It consists of a drill or boring bar, B, and the short shank, A, the ends of each being slightly convex as shown. The spring, C, is wound close, slipped over the joint and soldered at each end as shown at S. The spring should be wound so as to fit the cores, and in such direction as to cause it to have a tendency to close tighter on the cores from the resistance of the cut, says American Machinist. The ends of the bar and shank being convex, the flexibility of

the spring will readily permit of considerable deflection in the alignment of the bar and driving spindle.

An Ever Ready Wrench

Forge an old file into the shape shown in Fig. 1, forming a screwdriver on the handle end. Cut a piece of sheet metal in the shape shown in

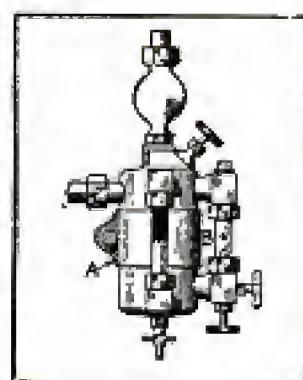


Handy Pipe Wrench

Fig. 2 and make a small piece of steel the same thickness as the handle and with small notches as in Fig. 3. Bend the sheet metal to fit around the handle and rivet the small piece of steel in between the curved ends. This piece is then placed on the handle, as in Fig. 4, and a pin inserted in a hole to suit the work at hand. This will make a handy tool for any light work.—Contributed by R. Doyle, New York.

Repairing a Burst Lubricator

Recently I had my 1-pt. lubricator freeze and burst, which bulged it out so at the point marked B in sketch that it was useless. After removing the body from the fittings, I placed it on an anvil and hammered it back to the original shape by light careful blows. A clasp was found which

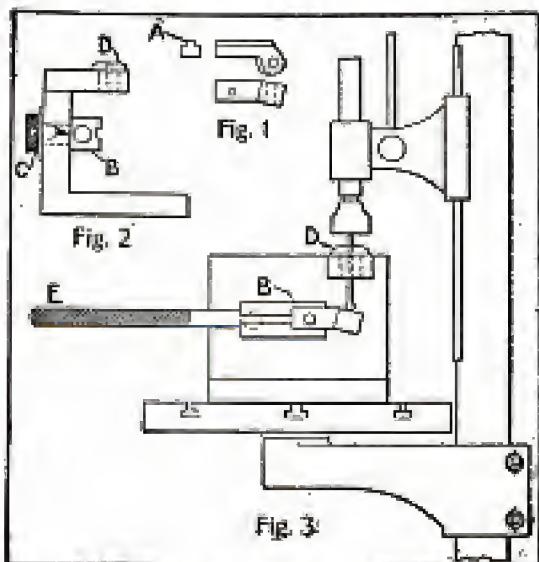


Bandaged Lubricator

I used as a bandage, A, with a piece of leather for a gasket. The lubricator worked as well as ever after placed in position, and saved the cost of a new one.—Contributed by P. W. Ostwald, Bayfield, Colo.

How to Drill Curved Holes

The accompanying cut illustrates a method of drilling holes that follow the arc of a circle. Fig. 1 shows the piece after it is finished. The tongue-piece, A, is milled so it fits into the groove of the holder, B, Fig. 2. This holder fits closely into a hole in the angle



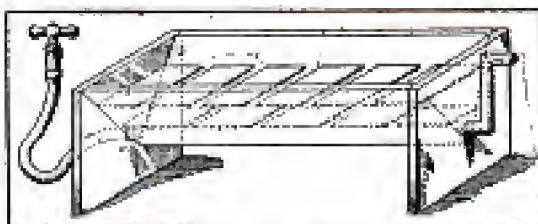
For Drilling Curved Holes

plate, and it is held against the plate by the nut C, which is just loose enough to permit the holder being turned on its axis. The drill bushing, D, is located above the work as shown. The hole through the bushing which guides the drill is made to fit the shank of the drill instead of the point, says Machinery. The drill is flat-pointed, and its shank is much smaller than the point, so that it will allow the work, when being drilled, to turn without rubbing against the shank. The reamer is of the ball type, and it is essential that the ball be round if the hole is to be accurate. The shanks of both drill and reamer are ground and lapped to fit the hole in the bushing D.

Fig. 3 illustrates the way in which the jig and the work are placed on the drill-press. The work is fastened to the holder by a bolt, as shown, and its position located with a height gauge. By pressing down on the handle, E, the work is fed against the drill, and the hole is drilled on an arc, the radius of which will depend upon the distance from the axis of the holder to the drill.

A Simple, Effective Negative Washer

The device consists of a V-shaped trough with the end pieces square to furnish a support. It should be made of sufficient dimensions to accommodate the sizes of plates being used. A few coats of some good waterproof paint will make it practically indestructible. If for 5 by 7-in. plates the sides should measure 30 by 7 $\frac{1}{2}$ in. and be joined together at right angles at the bottom, says Camera Craft. The water enters the washer through a piece of hose attached to the tap and fitting over a short piece of pipe at the end. After passing through the washer it leaves through a siphon formed of piping at the other end. This pipe should be a trifle larger than the inlet pipe and then there will be no danger of overflow. The plates should be placed in the washer as shown with their film sides down. Sediment or dirt cannot come in contact with the film, and instead of the water pushing the dense

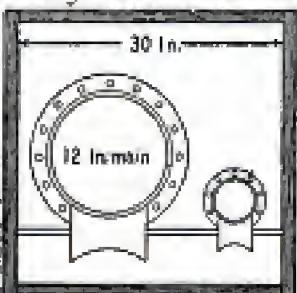


Negative Washer

hypo solution against the plates and then out over the top, as in many forms of washers, this simple device gives the plates a constant soaking in fresh water in such a position that the hypo falls to the bottom, where it is carried off through the outlet pipe.

Placing a Pipe in an Old Trench

A corporation owning several hundred flats in Hoboken, New Jersey, proposed to heat and light them with exhaust steam from a power plant recently constructed. An old trench was in the street 3 ft. below the pavement and 220 ft. in length from one man-hole to the other. As the city would not give a permit to dig up



the old trench, the construction company decided to use it temporarily for a vacuum return pipe during the winter. The trench was 30 in. square and already contained a 12-in. main with projecting flanges at the joints, and a 4-in. pipe as shown in the illustration. The heat had not been turned off from the pipes for ten years previous. After the heat was turned off and the trench allowed to cool for two days, an attempt was made to send a sewer dog through, which failed. The next thing to do was to send the smallest man employed through. The man that volunteered started on his trip with a wire attached to one foot and a string to the other. The important feature was that the string could be broken, pulled out and used as a measure above ground to locate the man for the digging gang in case he got stuck. The wire was to draw a cable through if he succeeded in getting through himself. The extremely narrow quarters, the projecting flanges at each joint, and the intense heat made the trip a perilous and extremely difficult one, but it was successfully accomplished in one hour and a half.

As a small portion of zinc greatly aids the reduction of silver in the bath, small steel articles should be brass plated instead of copper plated previous to dip-silvering. The zinc contained in the brass makes the silver appear whiter and a heavier deposit is formed.

A Sack Holder

The accompanying illustration shows a very handy device that may be applied to a truck or attached to a stand of its own. It is composed of a circular piece of sheet metal that is made funnel-shaped at the top and the proper size to fit the mouth of the sack at the

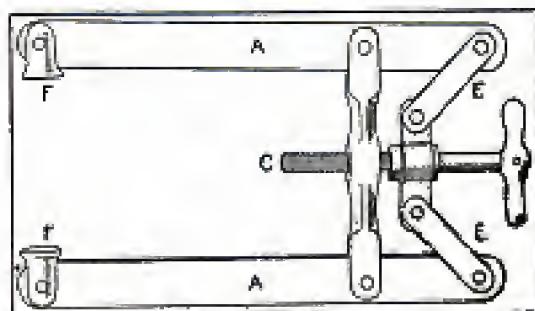


Sack Holder

bottom, says American Miller. Around the bottom part is a strap attached with a clamping device as shown to hold the sack in place while in operation. The device is attached by two braces to a truck or may be fitted to a special truck frame.

Another Pattern-Maker's Clamp

In a recent issue of Popular Mechanics an illustrated article on a pattern-maker's clamp was given. The



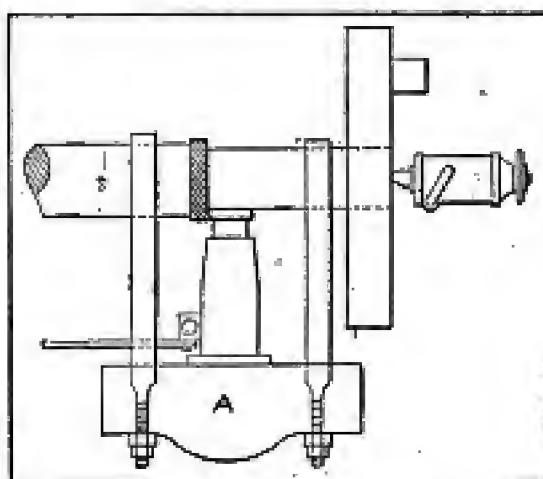
Toggle Links, E E, Work in Reverse

device as shown in the accompanying sketch is an improvement on this clamp. The toggle links, E E, work in reverse and allow the screw to back away from the work as it tightens on the material that may be clamped in the jaws, F F.—Contributed by L. N. Tanner, Lowell, Mass.



Straightening a Large Armature Shaft

A large 7-in. direct connected armature shaft was sprung $\frac{1}{8}$ -in. in one bearing close to the spiral gear. It was a case of straighten or make a new shaft. As there were two steel discs



Straightening a Bent Shaft

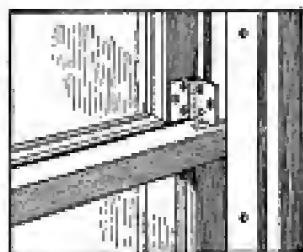
and two spiral gears that were shrunk on and an armature to remove it was decided to straighten it. The shaft was hung in the lathe centers, and a piece of sheet iron placed on the lathe bed, on which fire brick was built up around the shaft, thus forming an arch to hold the coke. A blowpipe of air and gas was placed through the side of the arch and directly under the shaft, which was turned occasionally to get an even heat, says a correspondent in American Machinist. When red hot a 100-ton hydraulic press, A, was attached by blocking up even with the centers and using two U-bolts around the shaft with a clamp on each across the back end of the press as shown. After 80 tons pressure was placed upon it and released it still was

found to be $\frac{1}{16}$ in. out of true. After repeating the operation twice with less pressure the shaft ran true. The shaft was allowed to revolve in the lathe until cold, and after filing and polishing it was replaced in the engine.

A Lock for the Window

Secure a small plain hinge about $1\frac{1}{2}$ in. long and 1 in. wide when closed.

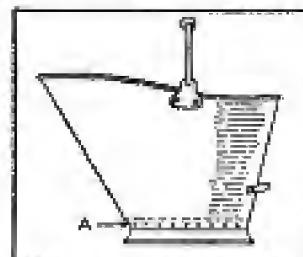
Place the hinge on the lower right-hand corner of the upper window sash, as shown, and fasten one side to the sash with screws.



This will leave the other side of the hinge to turn. To lock the window, turn the free side of the hinge as far back as possible, which brings it over the lower sash. The hinge will not be noticed from the outside, but will prevent the lower sash from being raised or the upper one lowered. When the hinge is closed it will not be in the way of raising the window.

Increasing the Life of Coal Hods

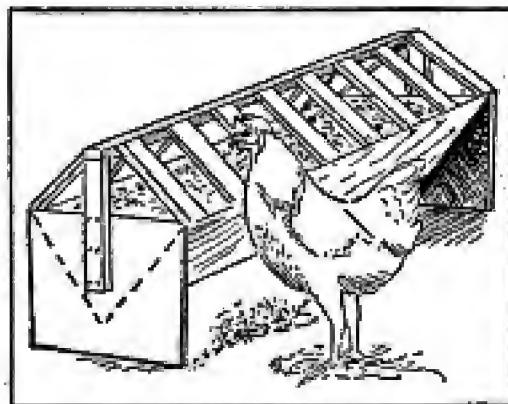
The bottom of coal hods wear through quicker than the sides on account of receiving more force from the coal and rust caused by dampness. If a wood bottom is placed on top of the metal one it will take up the wear. A piece of paper is cut to fit the bottom of the hod and used as a pattern in marking out a piece of wood. A $\frac{3}{8}$ -in. thick board will do, which should be free from cracks. After marking the wood from the pattern it is cut and shaped to fit the slope in the front and back of the hod. After placing the wood on top of the metal



bottom, holes are punched through the metal sides at the bottom, as shown at A in the sketch. Drive nails through these holes into the wood bottom to hold it in. This will increase the service of a coal hod several times.

How to Make a Poultry Feed Trough

A large feed trough to feed poultry may be made from two pieces of lumber, 6 or 8 in. wide and nailed together, forming a V-shaped trough, says the Poultry Keeper. Nail a piece of board 10 by 14 in. at each end, which will stop up the ends and also serve as legs.



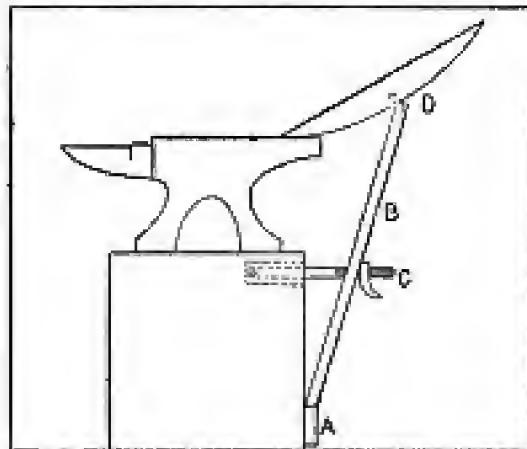
Poultry Feed Trough

On these ends nail two uprights and a strip across the top, which will serve as a handle. From this handle strip to the edge of the trough nail other strips about 3 in. apart to prevent the fowls from getting into the feed with their feet.

Holder for Plow Discs While Sharpening

A piece of 2 by 4-in. block, A, is beveled on the upper end and fastened to the anvil block as shown. Another piece of 2 by 4-in. material, B, is fitted on top of the small block, which should be long enough to stand about 3½-in. above the anvil. A ½ by 8-in. bolt, C, with a ¼-in. hole in one end and a thread made on the other serves to hold the upright piece, B, in position. A hardwood pin, D, about 4 in. long is

fitted in the upper end of the upright piece, B, to receive the disc. When the disc is heated it is removed from



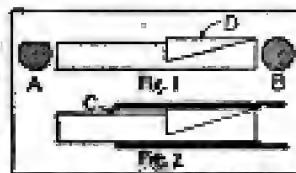
Disc Can Be Turned on Pin

the fire and placed on the pin, D, and adjustment made by the bolt C. The disc can be turned around on the pin and the hammering will be made even all around.—Contributed by Farmer Williamson, Durango, Colo.

Removing a Broken Tuning Valve

After several trials to remove a stuck tuning valve in a horn the part on the outside was broken off flush. The problem was to remove the broken part remaining.

After some thought the workman secured a round piece of brass near the

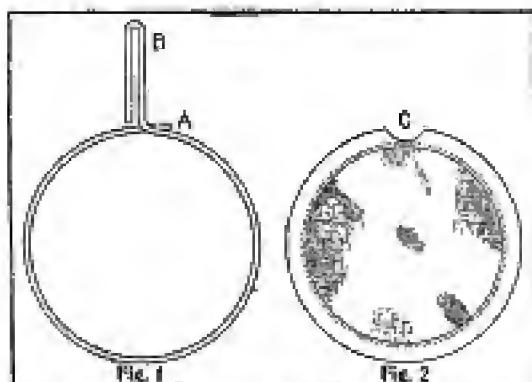


size of the hole in the broken valve. One end of the brass rod was cut out in a wedge-shaped notch as shown at D, Fig. 1, and a wedge was made to fit this notch with its outside roughened. The part of the brass rod back of the wedge was filed flat, as shown in the end view, A, Fig. 1, while the other end, B, including the wedge, remained round. This tool was inserted into the broken valve and a thin piece of metal placed in the space, C, left by the flat part filed on the rod, and used to drive the wedge tight against the broken valve part. A little beat

was applied and the part removed and repaired without trouble.

How to Make a Water Strainer

Bend a piece of heavy wire in a circle as shown in Fig. 1, forming a handle, B, on one end of the wire and



Water Screen

the other is lapped over a little, as shown at A. This circle should be about $12\frac{1}{2}$ in. in diameter. Cut a circular piece of cheese cloth about 15 in. in diameter and make a broad, loose hem around the edge, Fig. 2, cutting out a small notch, G, in the edge. After the hem is made the diameter of the cloth should be about 13 in. The end of the wire, A, Fig. 1, is inserted in the hem of the cheese cloth circle, C, Fig. 2, and the cloth is pushed around until the wire circle is enclosed in the hem of the cloth. Before pumping a pail of water lay the strainer thus made over the pail. When through pumping remove the strainer and give

it a vigorous shake and hang up to dry. Two or three cloth circles should be provided, so that the one in use may be removed and dried.—Contributed by R. B. Reynolds.

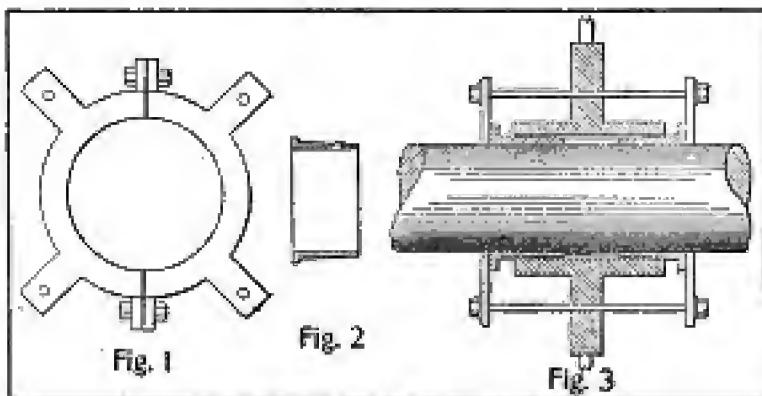
How to Repair Lathe Bronze Bearings

File or plane the joints of the bronze bearings and after placing together cover the outside with solder. Turn the spindle to remove all wear. Center the bearings in the chuck and bore out to fit the turned spindle. Then place them on a mandrel and turn off the solder to fit the housing. Saw them apart at the old joints and place in position. This will give a new wearing surface on both the spindle and bronze bearings, making them as good as new.—Contributed by E. R. Thompson, Harvard, Ill.

It is easy to determine in what part of the country brass foundry ashes and skimmings originate when found in the hands of the metal dealer, as in New England anthracite coal is used in melting. In the West, South and Middle West coke is used.

How to Tighten a Worn Blower Fan

A large fan in the heating system of a manufacturing plant had become quite racked. All the rivets were loose and the spiders were so worn that they did not fit the shaft by about $\frac{1}{4}$ in. The shaft was 5 in. in diameter. The fan could not be spared long enough to have a new shaft made and the spiders re-bored, says a correspondent in Power. A plan was adopted as illustrated by the accompanying sketch. Two taper brass sleeves, Fig. 2, were made for wedges, the inside diameter being just a trifle over that

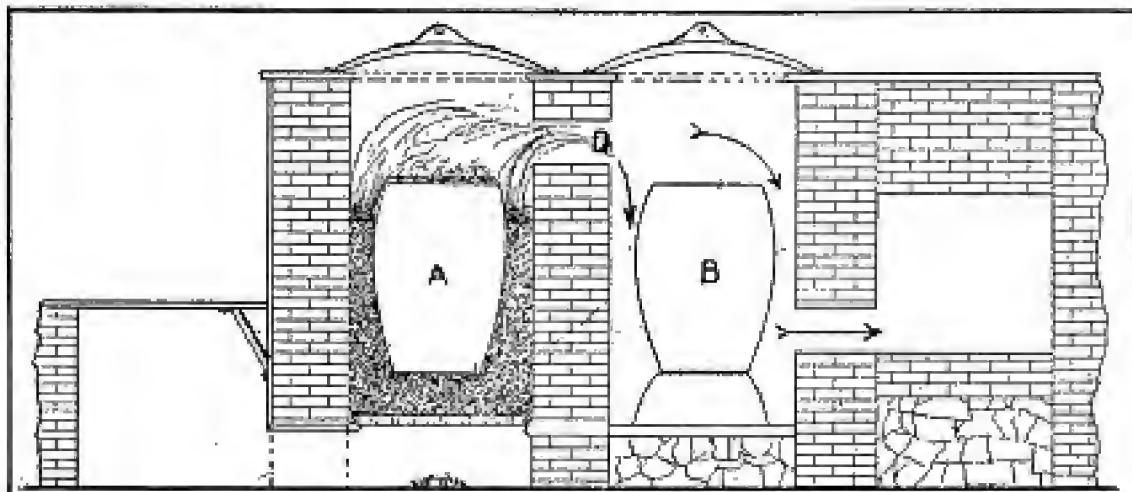


Factoring a Blower Fan to the Shaft

of the shaft, each with a flange on the thick end. Then two cast-iron spiders were constructed in four sections, and the halves bolted together, as in Fig. 1. These were bored to fit loosely on the shaft. After slipping the cone sleeves under the hub of the fan, as in Fig. 3, the cast-iron spiders were put on, one on each side, and four $\frac{1}{2}$ -in. tie-rods, with threads and nuts on each end, were passed through the holes in the spiders' arms, going between the arms of the fan. Turning up the nuts on the rods drew up the spiders and wedged the sleeves solidly in place under the fan bearing without throwing the fan off center.

A Tandem Crucible Furnace

For many purposes the tandem crucible furnace will be found quite useful and well worth the cost of installation. Most furnaces in use at the present time are based upon the principle of the tandem furnace. The old tandem furnace was the form in which the waste heat was utilized. The furnace shown in the sketch consists of two similar ones placed in tandem, so that the waste heat from one is utilized for heating the other. If a good natural draught is had, the problem is not difficult. In constructing a tandem furnace all that is needed is to place two similar furnaces together with the flue from the



Crucible Furnace Which Utilizes Waste Heat

An Emergency Bake Oven

Quite recently my wife had just gotten a dish of beans ready for cooking, when to her dismay she discovered that the gas had been turned off. She also had a pan of biscuit dough ready for the oven. What to do she did not know. More for a joke than anything else I replied, "I will show you how to cook them."

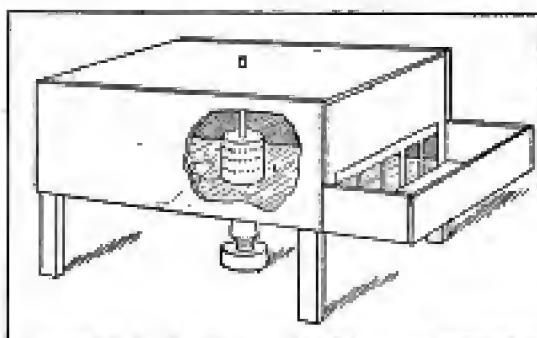
I went to the hard coal stove, shook down the ashes and dumped them and put the beans and biscuit dough in the ash pan, covering them with a tin cover, and then replaced the pan in the stove and awaited developments. I never tasted better beans and biscuit in my life.—Contributed by Charles Clement Bradley, West Toledo, Ohio.

second passing out from the bottom and into the chimney.

The first furnace is of the usual type, and the crucible, A, sets upon the coke or coal in the regular manner. The covers should close the furnace as tightly as possible, says *The Brass World*. The flame passes through the flue, D, into the second furnace in which the crucible, B, rests. The bottom of an old crucible is used in the furnace and the crucible sets upon it. From this furnace the flame passes through the bottom flue into the main chimney. The heat that passes into the second furnace is usually insufficient to melt copper, or even brass, but for aluminum, soft metals or warming up a crucible so that it can be introduced into the first furnace it serves a good purpose.

A Home-Made Brooder

The accompanying sketch shows how to construct a brooder that will not require much time to make, says a correspondent in the *Poultry Keeper*. Se-

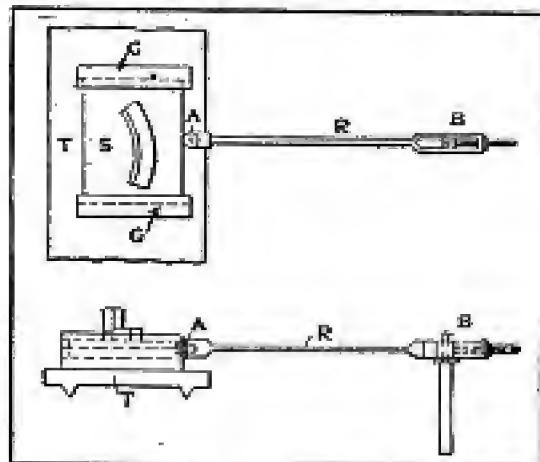


Inexpensive Brooder

ure a box and in the center of the bottom cut a circular hole just large enough to receive a common tomato can. Holes are punched in the side of the can and also a hole cut in its bottom large enough for a 1½-in. pipe. A hole is then cut in the top of the box for this pipe to extend through from the top of the tomato can, which rests on the bottom of the box, as shown. A common lamp furnishes the heat to the radiator formed by the tomato can.

How to Machine an Arc on a Planer

The following is a description of an attachment used on a planer to machine arcs: Referring to the illustration, T is the table of the planer, S the slide moving in the gibbs C and G which



Cutting Arcs on a Planer

are fastened on the planer table. The point A of the slide and a vertical shaft, B, are connected by the rod R. This rod R is made adjustable for different radii, says the *American Machinist*. The part to be machined is placed on the slide and the tool is clamped on the planer head. The machined line obtained is an exact arc.

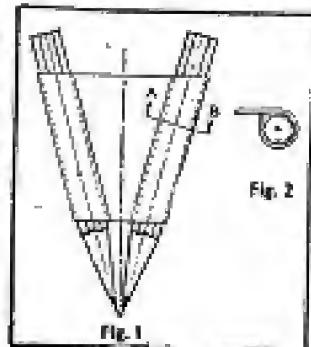
A Paint Brush and Pail Holder

Various hooks are used by painters on ladders to hold the paint pail. In the sketch is shown how to make a paint brush and pail holder combined by using a heavy wire. A hook formed as shown may be attached to any rung of the ladder and not interfere with the climbing of the workman.



Home-Made Instrument to Draw Parallel Lines

A device that consists of a thin sheet of tin or aluminum, bent as shown, with two common lead pencils held in pockets at each edge of the sheet, makes it possible to draw two parallel lines to be used as guide lines for lettering on a drawing. A cross section of the pockets, A B, is shown in Fig. 2. The pencils may be moved up or down to vary the spacing of the lines, and can easily be removed for sharpening, says *American Machinist*. This instrument is a time saver, but its chief merit lies in the fact that by its use the lettering on a drawing is more uniform in height than when the guide lines are spaced by guess.

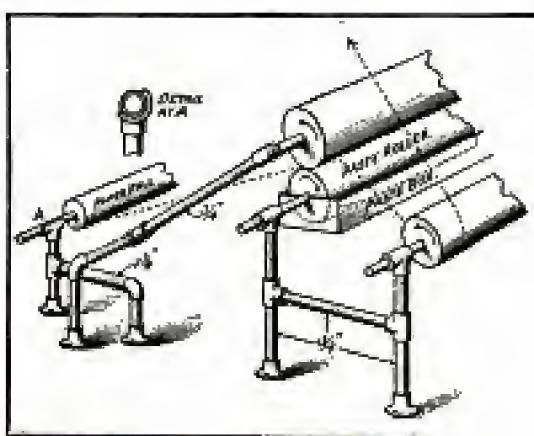


How to Make Pipe Coverings

Coverings may be made in small shops by means of rolls supported by pipe and fittings as shown in the sketch. Coverings are composed of a layer of asbestos paper, then wool felt building paper and finally a canvas jacket. The size depends on the size of pipe used and wooden rolls must be provided for each size of pipe. These rolls are divided longitudinally into halves so that the end of the paper can be clutched between them when the rolling of the paper is started. The roll of wool felt is mounted on an iron pipe which, extending beyond the roll, is supported by a tee cut longitudinally to serve as a bearing for each end of the pipe roller, as shown at A in the sketch. The paper in unrolling is then passed between two rolls, the lower one of which is partly submerged in paste in a box for holding the paste, so that the wool felt in passing over the roll receives an application of the paste carried up by the roll in its turning. The upper roll serves as a weight to bring the paper in close contact with the paste roller and also to squeeze the wool felt against the roller so that only the proper amount of paste is used, says *The Metal Worker*. The paper is then passed over an idle roller, and is finally drawn to the work bench, on which is mounted the wooden form needed for each size of pipe. It will thus be seen that it is only necessary to keep rolling the wool felt on the form, after the single thickness of asbestos paper has first been applied, until the desired thickness is obtained, when the covering is ready to be dried before wrapping in the light canvas protection.

The finished roll will dry quickly in an ordinary atmosphere, but if made at times when it should not dry quickly, mold might set in and the paste not set properly. A small drying room may be constructed and heated with a set of horizontal pipes connected at the ends by return bends to be used for the circulation of hot water. The

coverings are stacked vertically in this drying room and when the hot water is circulated the heat serves to drive off

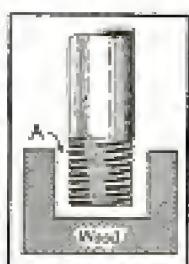


Making Pipe Coverings

the moisture from the paste quickly. The water may be heated by a gas water heater using illuminating gas and placed just outside the drying room. A small circular saw is used for trimming the ends of the coverings when finished, although where a large quantity is not made a common hand saw will answer the purpose.

Home-Made Pipe Cap

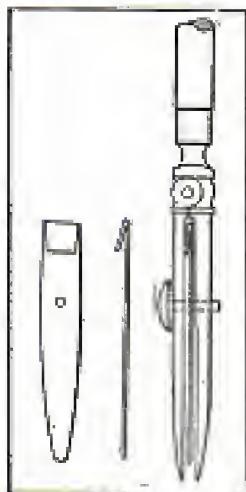
Bore a hole in a block of wood about 1 in. deep and $\frac{1}{2}$ to 1 in. larger than the pipe on which the cap is to be used. Plug the threaded end of a short piece of pipe with putty or clay. If clay is used, it must be dried after placing in the pipe. Hold this plugged end of the pipe in the hole made in the wood block, allowing



equal distances on the sides as well as the end, as shown in the sketch. Pour into the space, A, around the pipe threads melted lead, and when cool the pipe is unscrewed. By adding some zinc to the lead a cap can be made that will hold the pressure of most city water mains.—Contributed by James E. Noble, Toronto, Canada.

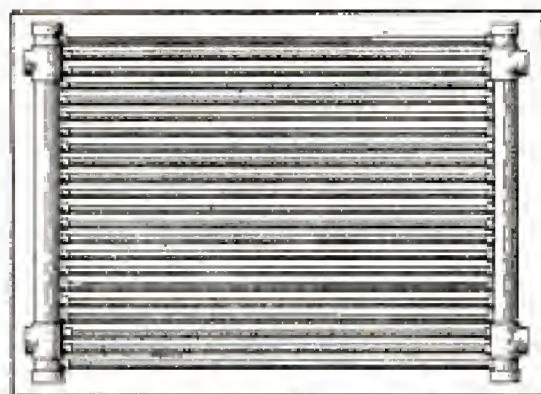
Increasing the Ink Capacity in a Drawing Pen

The ordinary drawing pen will not hold sufficient ink to enable one to draw a broad line of reasonable length. A simple attachment as shown in the sketch will supply the pen to be used with plenty of ink for broad lines, says the American Machinist. A thin piece of steel is filed and bent to shape. A hole is drilled a little smaller than the diameter of the adjusting screw of the pen. When screwed in, the strip is kept tight on the screw and central between the nibs. The strip can be swiveled around so that the pen may be easily cleaned, and can be taken off when not in use.



A Home-Made Boiler Grate

A construction company had to ship their outfit a considerable distance and when putting their power plant in order found that the grates for the boilers were lost in transit. As it was several hundred miles from a manufacturing plant, the engineer had to construct a makeshift grate for immediate use. Some old $\frac{3}{4}$ -in. pipe, including some fittings, was found about the

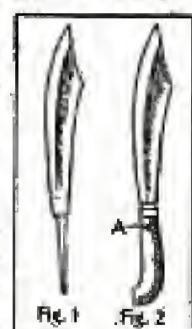


Home-Made Boiler Grate

place. Two pieces of 2-in. pipe were cut as long as the width of the firebox. A malleable 2-in. tee was placed on each end of the pipe. One side of each 2-in. pipe was drilled and tapped, one with right hand and the other with left hand threads, to receive the $\frac{3}{4}$ -in. pipe. Threads were cut on each end of the $\frac{3}{4}$ -in. pipe, one end with right hand and the other with left hand threads, leaving a long thread and making them the length of the firebox. Collars were made by cutting small pieces from 1-in. pipe and tapping one set with right hand and the other with left hand threads. When putting the whole device together, as shown in the sketch, the collars were used as lock-nuts on each end of the $\frac{3}{4}$ -in. pipe. The 2-in. pipes were capped on the ends, leaving the opening in the tee to form a circulation of air through the pipes. Water was kept in the ash pit and this device was used for several months without a sign of burning out.

How to Fit Handles to Carving Knives

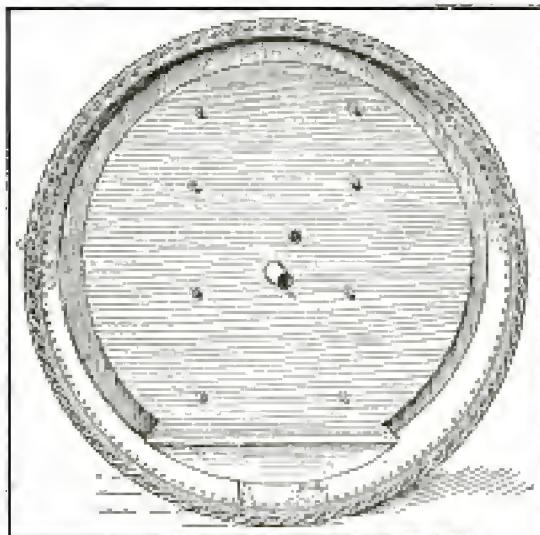
The shank of the blade should be forged the same shape as a flat file shank, tapering and square, as shown in Fig. 1. A piece of wood is secured and a hole bored in the end to receive the shank. The wood should be dressed to the shape desired for a handle while on the shank to keep it straight with the blade. After removing the blade, bore a $\frac{3}{8}$ -in. hole through the handle, A, Fig. 2, and wrap the handle with paper, covering the hole, A, and extending it over the end of the handle about $\frac{1}{2}$ in. The shank of the blade is again placed in the handle, and while held in an upright position melted solder poured into the space between the paper and the blade. This will fill the space around the square shank and the hole A, and will make a



ferrule at the end of the wood handle. This will always hold the blade solid in the handle. Solder must be used and not babbitt.

Gasket Made of Wound Asbestos Cord

This is a simple method of making a gasket or washer of $\frac{1}{8}$ -in. wound asbestos packing, or cord. The cords are alter-

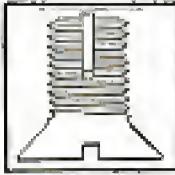


Asbestos Packing Gasket

nately passed around short bolts, as shown by this tank, which is used to separate crude oil from the sand brought up by the pumps. It is subjected to a slight steam pressure when the lid is on.

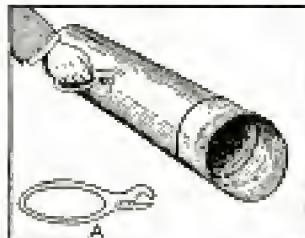
How to Tighten a Worn Screw

A screw was worn so that it was too small for the hole in a certain place on a printing press, and not being able to obtain one of suitable shape and size, a correspondent in Machinery used the old one by placing it between two pieces of wood in a vise and cutting a slot as shown in the sketch. The slot was opened a little and a flat iron wedge driven in. The screw was then turned into its place, where it held as good as a new one. This method could be used also with bolts where the nut will not stay.



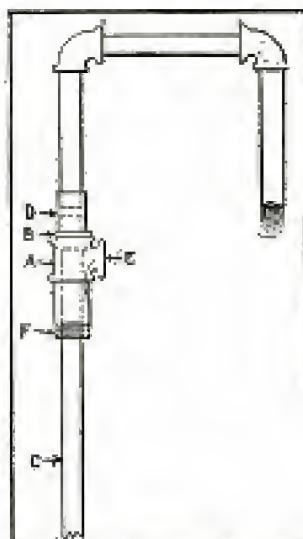
How to Cut Stovepipe

Where short joints of stovepipe are needed the cutting of them with tinsmiths' shears or a chisel does not make a very good piece of work. Use a common can opener as shown at A in sketch and the work will be easily done and the ends will have a smooth edge.—J. E. M.



Emptying Oil Barrels with Compressed Air

A great many barrels of oil had to be emptied and, as compressed air was close at hand, a correspondent in Power made a device as illustrated to do the work. On one end of a 7-in. length of 1-in. pipe, threaded at both ends, was screwed a 1-in. tee, A, and a 1 by $\frac{1}{2}$ -in. bushing, B, was turned to one side of the tee. A long thread was cut on one end of a 35-in. section of $\frac{1}{2}$ -in. pipe, and in the other end were filed four notches $\frac{1}{8}$ in. deep. This end of the long pipe was inserted in the 1-in. pipe and the threaded end of the $\frac{1}{2}$ -in. pipe was turned into the bushing, $\frac{1}{2}$ in. of the thread extending from the top to receive a $\frac{1}{2}$ -in. coupling, D. One end of a 16-in. section of $\frac{1}{2}$ -in. pipe, which was threaded on both ends, was inserted into the coupling, and an elbow turned on the other end. The side outlet, E, of the tee was used for the air connection.



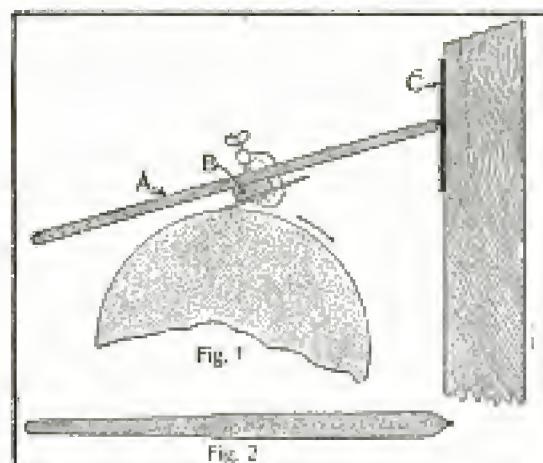
A $1\frac{1}{2}$ -in. hole is bored into the bung of the barrel and the free end of the 1-in. pipe, F, turned into it. The compressed air connection may be made by means of a rubber hose, or any suitable means will do. By being careful not to use too much air pressure, the device will empty a barrel in five minutes as thoroughly as if drained.

♦ ♦ ♦

A Holder for Tool Grinding

♦ ♦ ♦

Edge tools, such as chisels and plane irons, are now put on the market



Holding Tools for Grinding

ground and honed, but the ordinary shop appliances for grinding them are often far from satisfactory. Every worker knows that the bevel on the cutting edge of a plane iron or chisel should be uniform and flat, but there are many workmen that will hold these tools in their hands and attempt grinding without the aid of any support. More often the result is a convex instead of a flat or concave bevel. The accompanying sketch shows a device for holding these tools while grinding. A wood bar, A, Fig. 1, is made from 1 or $1\frac{1}{4}$ -in. material, about $2\frac{1}{2}$ in. wide and $3\frac{1}{2}$ ft. long. Fig. 2 shows the top view of this bar. One end is shaped into a handle, into the other has been turned a screw the depth of the threads, the head is clipped off and the end of the shank filed rounding for a pivot. The block B, 4 or 5 in. long, and the width of A, is screwed to it and carries the tool to be ground. In this case the

tool is a plane iron clamped to the block with a thumb screw.

On the post just back of the grindstone is fastened a strip of $\frac{3}{4}$ by 1-in. iron with holes drilled in a row about $\frac{1}{2}$ in. apart and numbered. These holes should only be drilled a part of the way in the metal. When the plane iron has been clamped to the block so that the cutting edge is not more than 1 in. ahead of it, the pivot is set in any hole and the iron dropped on the stone. A few seconds of grinding will show the new bevel and if this should not be what is wanted, set the pivot in another hole and try again. Not more than one or two changes will usually be required. When the proper hole has been found note its number.

With this device the stone may be turned by one hand and the tool managed with the other. Even on a power-turned stone one hand is better than two, says Wood Craft. The tool may be turned over as many times as desired in the process of grinding to note its progress and it drops back on the same bevel when replaced. Should the pivot slip out of the hole, be sure and replace it in the same hole. It is rapid and accurate, and even in the hands of a boy it is quickly mastered and gives the best of results.

♦ ♦ ♦

Wheelbarrow Bucket for Handling Concrete

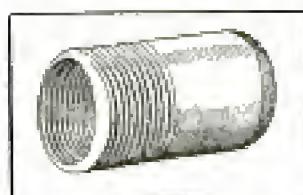
♦ ♦ ♦

This wheelbarrow was designed for the handling of concrete. The central stem by which the bucket is hoisted carries a wheel, so that, with handles attached, the bucket becomes a wheelbarrow. The handles are detachable. The proportions of concrete are measured by rows of rivets around the bucket. It is also adaptable for handling coal, earth and other materials, and can be hoisted.



Quickly Made Pipe Reducer

If in doing some pipe fitting you do not have a reducer at hand you can

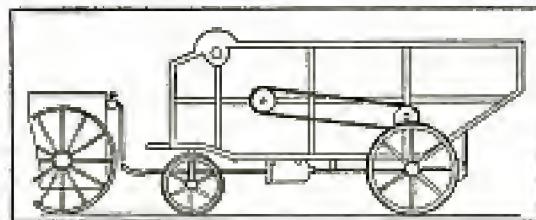


make one out of a pipe coupling. Place the coupling on the end of a pipe and clamp the whole in a vise.

Cut threads about one-half the way over the outside of the coupling and you will have a first-class reducer.—Contributed by Wm. Erickson, Chicago.

Steam Brake for Threshing Machines

The modern method of threshing is not only one involving power for operation, but the same power is used to draw the outfit from one place to another.

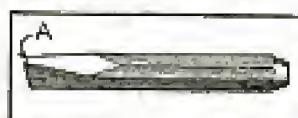


Wheel Brake Operated by Steam

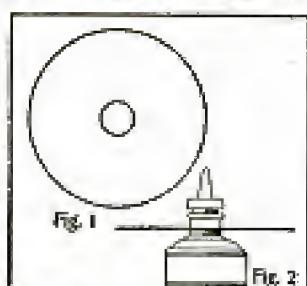
These wagon trains often have steep hills to descend which call for considerable skill to prevent the train from running away. A recent invention has provided a wheel brake operated by steam from the boiler of the traction engine. The steam pipe is carried beneath the bodies of the several vehicles the entire length of the train and is controlled by the engineer.

A Tool for Cutting Hardened Steel Wire

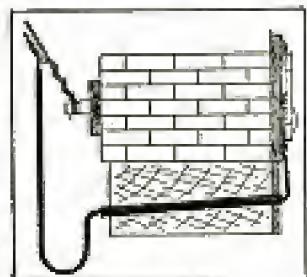
Pliers and chisels are often spoiled by trying to cut hardened steel wire. Grind the chisel with a face about $\frac{1}{32}$ in., as shown in the sketch at A. This will cut the wire without injury to the tool.—Contributed by G. M. Coleman, Sandusky, O.

**Keeping an Ink Bottle from Turning Over**

Cut a circle about 5 in. in diameter from a heavy piece of cardboard. Make a hole in the center that will fit tightly over the neck of the bottle as shown in Fig. 1. After it is placed on the neck of the bottle, Fig. 2, the bottle cannot turn over far enough to spill the ink.

**How to Attach Drop Wires**

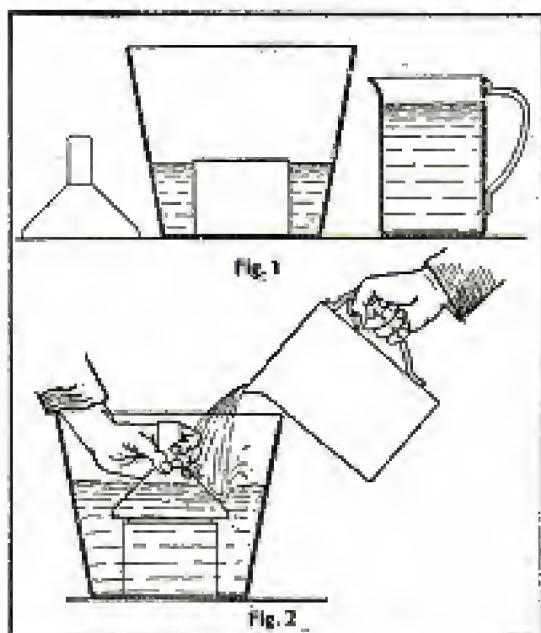
The following rules have been found to cover the installation of drop wires to an extent sufficient to insure good work: Drop wires are to be securely fastened to the outside of the building by means of heavy knobs and screws, and left long enough to project through the window casing and up to the protector. About 6 ft. of wire will be sufficient. The drop wire must be run through the window casing in tubes of approved insulating material. In boring the holes through the window casing for the tubes they must be bored so that they will have a slant downward of about $\frac{1}{2}$ in. in 6 in. toward the outside of the building, says the American Telephone Journal. This will prevent water from dripping through the tubes into the building. The tubes must be cut long enough to allow a projection of about $\frac{1}{2}$ in. on the outside of the window casing, and must be cut of the requisite length for the casing on the outside. Just before the drop wires reach the outside ends of tubes they are to be bent into a drip loop, to prevent water from following the wires into the building. The holes



for the tubing must be bored not less than $2\frac{1}{2}$ in. apart, nor more than 5 in. The drop wires always must run directly to the posts marked line on the protector.

How to Harden Fine Circular Saws

Secure a bucket, a can or small pail and two pieces of flat-surfaced material larger than the saw to be hardened. Place one of the blocks in the bucket and fill with water barely to cover, as



Hardening Circular Saws

shown in Fig. 1. Have the can or small pail filled with water and within reach. The saw is now given the proper heat and quickly placed on the block in the pail and the other flat piece placed on top immediately, the whole being quickly covered with the water from the can or small pail. The result will be a hardened saw free from warps.

According to L'Electricien, a Vienna firm has recently placed on the market brushes made of glass, which are to replace emery cloth for cleaning and polishing the commutators of dynamos and motors. These brushes are said to clean the commutators without scoring the metal, and their use avoids the inconveniences and dangers of emery cloth.

How to Remove Old Putty

Remove the window sash and lay it flat on a table with the putty side up. Take a common spring-bottom oiler filled with gasoline and squirt a small quantity of gasoline on the putty all around the sash. Apply a match and the heat of the burning gasoline will soften the old hard putty so that it can be removed with a putty knife without cutting or defacing the sash. If the putty is very hard a second application of the gasoline may be necessary.

Making a Well House

A well house helps to keep the water in the well cool in summer, and also prevents the pump from freezing in the winter. If it is constructed along the lines as shown in the illustration, a well house may be made to add beauty to the surroundings, says the Country Gentleman. The one here shown is built directly upon the usual square well platform of plank, this being allowed to project some 6 in. all about the house. The roof is made to curve gracefully out to the eaves that overhang the walls. If the doorway is on the north side, no door need be used during the summer; but this should be in place in the winter, and the latticed windows should then have a sash fitted to them, or one opening can be fitted with sash and the other two covered with board shutters. A few vines or a shrub or two may be planted at the base of the walls to add to the attractiveness. So simple a little building can be easily made by the household mechanic.



A Substitute Boiler Compound

READY LUMBER

TABLE

leaves	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.680														
1½	.126	.168													
2	.167	.250	.333	.250											
2½	.298	.378	.450	.390											
3	.350	.475	.540	.633	.710	.81%									
4	.395	.525	.630	.730	.830	.930	.103								
4½	.435	.575	.690	.800	.910	.101	.111								
5	.477	.625	.730	.834	.940	.104	.115	.125							
5½	.518	.668	.780	.889	.999	.115	.125	.135	.145						
6	.560	.700	.810	.919	.1029	.1139	.1249	.1359	.1469	.1579					
6½	.592	.732	.842	.942	.1052	.1162	.1272	.1382	.1492	.1602	.1712				
7	.633	.773	.883	.983	.1093	.1203	.1313	.1423	.1533	.1643	.1753	.1863			
7½	.665	.804	.914	.1014	.1124	.1234	.1344	.1454	.1564	.1674	.1784	.1894	.1904		
8	.696	.835	.945	.1045	.1155	.1265	.1375	.1485	.1595	.1705	.1815	.1925	.1935		
8½	.727	.857	.967	.1067	.1177	.1287	.1397	.1507	.1617	.1727	.1837	.1947	.1957		
9	.758	.888	.998	.1098	.1208	.1318	.1428	.1538	.1648	.1758	.1868	.1978	.1988		
9½	.790	.910	.1010	.1110	.1210	.1310	.1410	.1510	.1610	.1710	.1810	.1910	.1920		
10	.821	.941	.1041	.1141	.1241	.1341	.1441	.1541	.1641	.1741	.1841	.1941	.1951		
10½	.852	.972	.1072	.1172	.1272	.1372	.1472	.1572	.1672	.1772	.1872	.1972	.1982		
11	.883	.1003	.1103	.1203	.1303	.1403	.1503	.1603	.1703	.1803	.1903	.1903			
11½	.914	.1034	.1134	.1234	.1334	.1434	.1534	.1634	.1734	.1834	.1934	.1934			
12	.945	.1064	.1164	.1264	.1364	.1464	.1564	.1664	.1764	.1864	.1964	.1964			
12½	.976	.1094	.1194	.1294	.1394	.1494	.1594	.1694	.1794	.1894	.1994	.1994			
13	.101	.111	.121	.131	.141	.151	.161	.171	.181	.191	.201	.211			
13½	.104	.114	.124	.134	.144	.154	.164	.174	.184	.194	.204	.214			
14	.107	.117	.127	.137	.147	.157	.167	.177	.187	.197	.207	.217			
14½	.110	.120	.130	.140	.150	.160	.170	.180	.190	.200	.210	.220			
15	.113	.123	.133	.143	.153	.163	.173	.183	.193	.203	.213	.223			
leaves	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

A contractor's plant was situated at a place where transportation facilities were not very good, and it was many miles from a manufacturing city which was their source of supply. The water used in the boilers contained so much alkali that it was impossible to run very long without cleaning the boilers from scale. No chemical or compound was at hand to be used. The engineer happened to notice some small shrubs known as sumac. He secured a quantity of the berries that are found on these shrubs and cooked them with steam in a tank, making a fluid which was used in the boilers and kept them satisfactorily clean.—Contributed by C. W. Greenleaf, Somerville, Mass.

**Showing the Board Feet in
One Linear Foot for Each
Dimension Given. One inch
to 15 inches, by half inches.**

Contributed by E. W. Bowen.

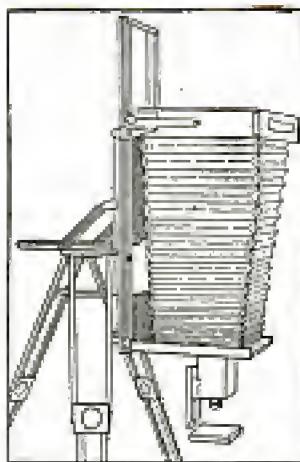


Amateur Mechanics



How to Enlarge from Life in the Camera

Usually the amateur photographer gets to a point in his work where the miscellaneous taking of everything in sight is somewhat unsatisfying. There

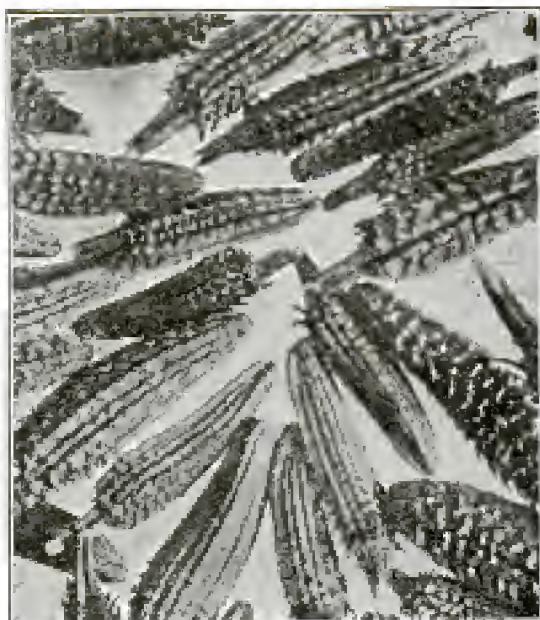


are many special fields he may enter, and one of them is photomicrography. It is usually understood that this branch of photography means an expensive apparatus. If the worker is not after too high a magnification,

however, there is a very simple and effective means of making photomicrographs which requires no additional apparatus which cannot be easily and quickly constructed at home.

Reproduced with this article is a photograph of dandelion seeds,—a magnification of nine diameters or eighty-one times. The apparatus which produced this photograph consisted of a camera of fairly long draw, a means for holding it vertical, a short focus lens, and, if possible, but not essential, a means for focusing that lens in a minute manner. On top of the tripod is the folding arrangement, which is easily constructed at home with two hinged boards, an old tripod screw, an old bed-plate from a camera for the screw to fit in, and two sliding brass pieces with set screws that may be purchased from any hardware store under the name of desk sliding braces. To the front board is attached a box carrying the lens and the bed of the sliding object carrier, which is actuated in a forward and back movement by the rack and pinion, which also can be obtained from hardware stores. If the bed for the object car-

rier be attached to the bed of the camera instead of the front board, the object carrier need have no independent movement of its own, focusing being done by the front and back focus of the camera; but this is less satis-

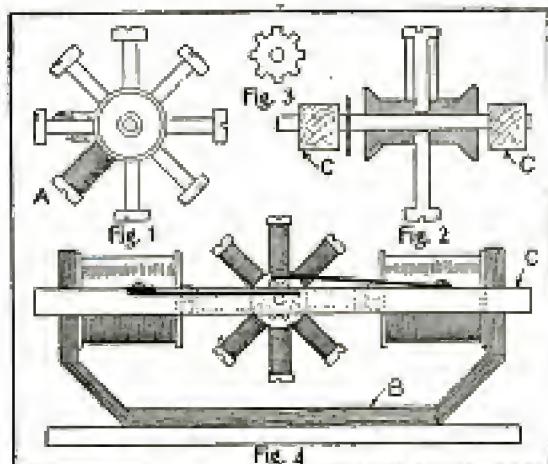


Magnified Nine Diameters

factory, particularly when accurate dimensions are to be determined, says the Photographic Times. This outfit need not be confined to seeds alone, but small flowers, earth, chemicals, insects and the thousand and one little things of daily life—all make beautiful and unique subjects for enlarged photographs. These cannot be made by making a usual photograph and enlarging through a lantern. When a gelatine dry plate is magnified nine diameters, the grains of silver in the negative will be magnified also and produce a result that will not stand close examination. Photographs made by photomicrography can be examined like any other photographs and show no more texture than will any print.

How to Make a Small Motor

The accompanying sketch shows how to make a small motor to run on three or four cells of dry batteries and to have power sufficient to run mechanical toys. The armature is constructed as shown in Figs. 1 and 2 by using a common spool with eight flat headed screws placed at equal distances



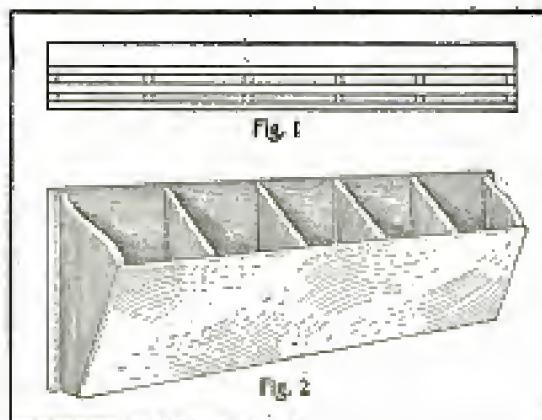
Details of Small Electric Motor

apart and in the middle of the spool. Each screw is wound with No. 24 iron wire as shown at A, Fig. 1. The commutator is made from a thin piece of copper 1 in. in diameter and cut as shown in Fig. 3, leaving eight points $\frac{1}{8}$ in. wide and $\frac{1}{2}$ in. deep. The field is built up by using eight strips of tin 12 in. long and 2 in. wide, riveted together and formed in the shape as shown at B in Fig. 4. Field magnets are constructed by using two $\frac{3}{8}$ -in. bolts $1\frac{1}{2}$ in. long. A circular piece of cardboard is placed on each end of the bolt, leaving space enough for the bolt to pass through the field, B, and to receive a nut. Wind the remaining space between the cardboards with 30 $\frac{1}{2}$ of No. 22 double wound cotton covered copper wire. A light frame of wood is built around the magnets as shown at C, Fig. 4. Holes are made in this frame to receive the $\frac{1}{2}$ of the armature. Two strips of copper $\frac{1}{2}$ in. wide and 3 in. long are used for the brushes. The armature is placed in position in its bearings and the brushes adjusted as shown in Fig. 4, one brush touching

the shaft of the armature outside of the frame, and the other just touching the points of the commutator, which is placed on the shaft inside of the frame. Connect the outside wire of one magnet to the inside wire of the other and the remaining ends, one to the batteries and back to the brush that touches the shaft, while the other is attached to the brush touching the commutator. In making the frame for the armature bearings, care should be taken to get the holes for the shaft centered and to see that the screws in the armature pass each bolt in the magnets at equal distances, which should be about $\frac{1}{2}$ in.

Home-Made Shoe Rack

The accompanying sketch explains itself as to how a boy can make his own shoe rack that can be placed on the wall in the clothes closet. Figure 1 shows the construction of the bottom to permit the dirt to fall through. Two boards, 9 in. wide and about 3 ft. long, with six partitions between as shown, will make pockets about 6 in. long.

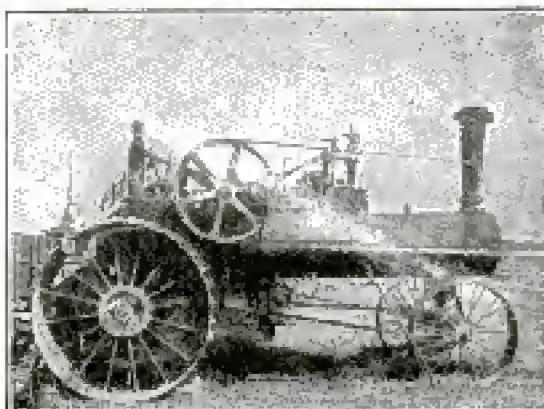


The width of the pockets at the bottom is 2 in. and at the top 5 in.—Contributed by Guy H. Harvey, Mill Valley, Cal.

Active construction work has been begun on the telephone lines which are to link the leading towns of China together. The construction and operation is entirely under control of the Chinese government.

Eleven-Year-Old Engineer

Probably the youngest engineer in the world is Marvin Wilkinson, 11 years old, who operates a big traction threshing engine for his father. During the past season he fired, oiled, kept water in the boiler and steam up, and ran the engine without a single stop or



Courtesy Am. Threshers
Youngest Engineer at Work

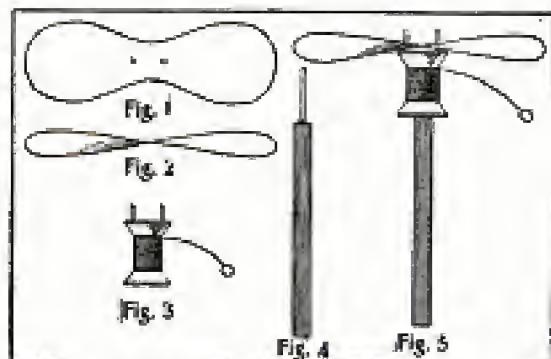
accident of any kind. Marvin is a Kansas boy.

How to Make a Flying-Machine

By WILL Patsul

While a great many people are looking forward to the time when we shall successfully travel through the air, we all may study the problem of aerial navigation by constructing for ourselves a small flying-machine as illustrated in this article.

A wing is made in the shape as shown in Fig. 1 by cutting it from the large piece of an old tin can, after melting the solder and removing the ends. This wing is then given a twist so that one end will be just opposite the other and appear as shown in Fig. 2. Secure a common spool and drive two nails in one end, leaving at least $\frac{1}{2}$ in. of each nail projecting after the head has been removed. Two holes are made in the wing, exactly central, to fit on these two nails. Another nail is driven part way into the end of a stick, Fig. 4, and the remaining part

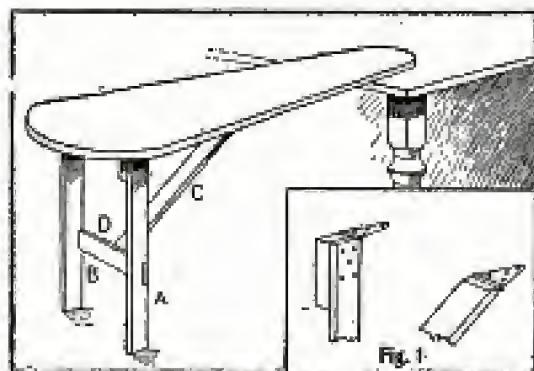


Home-Made Flying-Machine

is cut off so the length will be as long as the spool. A string is used around the spool in the same manner as on a top. The wing is placed on the two nails in the spool, and the spool placed on the nail in the stick, Fig. 5, and the flyer is ready for action. A quick pull on the string will cause the wing to leave the nails and soar upwards for a hundred feet or more. After a little experience in twisting the wing the operator will learn the proper shape to get the best results.

How to Make an Ironing-Board Stand

Secure some 1 by 3 in. boards about 3 ft. long and plane them smooth. Cut the two pieces A and B 30 in. long and make a notch in each of them, about one-third of the way from one end, 1 in. deep and 3 in. long. These notches are to receive the piece D, which has a small block fastened to its side to receive the end of the brace C. The brace C is 36 in. long. The

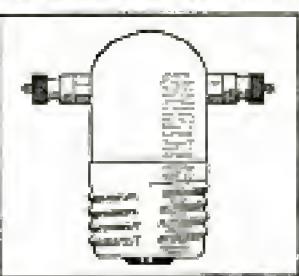


Ironing-Board Stand

upper ends of the pieces A, B and C are fastened to a common ironing board by using iron hinges as shown in Fig. 1. As the piece D is fitted loosely, it may be removed and the brace, C, with the legs, A and B, folded up against the board.—Contributed by Bert Kottinger, San Jose, Cal.

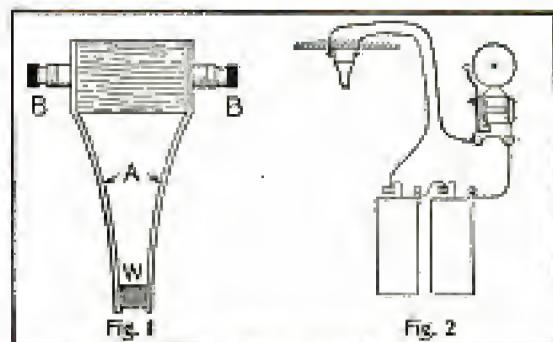
A Home-Made Electric Plug

A plug suitable for electric light extension or to be used in experimenting may be made from an old electric globe. The glass is removed with all the old composition in the brass receptacle,

leaving only the wires. On the ends of the wires, attach two small binding-posts. Fill the brass with plaster of paris, and in doing this keep the wires separate and the binding-posts opposite each other. Allow the plaster to project about $\frac{1}{4}$ in. above the brass, to hold the binding-posts as shown.—Contributed by Albert E. Welch, New York.

How to Make an Electric Fire Alarm

On each end of a block of wood, 1 in. square and $1\frac{1}{2}$ in. long, fasten a strip of brass $\frac{1}{8}$ by 3 in., bent in the shape as shown in the sketch at A, Fig. 1. These strips should have sufficient bend to allow the points to press tightly together. A piece of beeswax, W, is inserted between the points

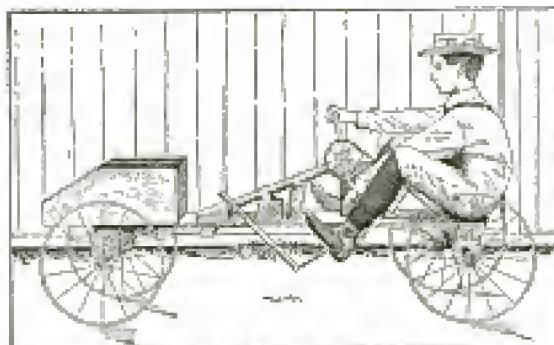


Fire Alarm Device

of the brass strips to keep them apart and to form the insulation. A binding-post, B, is attached to each brass strip on the ends of the block of wood. The device is fastened to the wall or ceiling, and wire connections made to the batteries and bells as shown in the diagram, Fig. 2. When the room becomes a little overheated the wax will melt and cause the brass strips to spring together, which will form the circuit and make the bell ring. Each room in the house may be connected with one of these devices, and all on one circuit with one bell.

Home-Made Boy's Car

The accompanying cut shows how a boy may construct his own auto car. The car consists of parts used from a boy's wagon and some old bicycle parts. The propelling device is made by using the hanger, with all its parts, from a bicycle. A part of the bicycle frame is

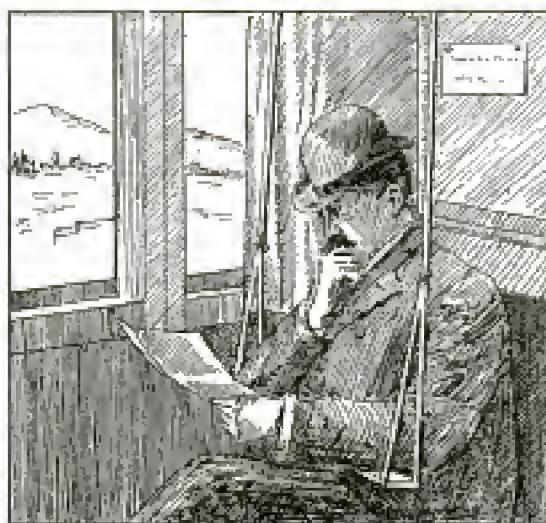


Boys' Home-Made Auto

left attached to the hanger and is fastened to the main board of the car by blocks of wood as shown. The chain of a bicycle is used to connect the crank hanger sprocket to a small sprocket fastened in the middle of the rear axle of the car. The front axle is fastened to a square block of wood, which is pivoted to the main board. Ropes are attached to the front axle and to the back part of the main board to be used with the feet in steering the car. To propel the auto, turn the cranks by taking hold of the bicycle pedals.—Contributed by Anders Neilsen, Oakland, Cal.

SWING ARM-REST ON TRAINS

A swing device on which the passengers can rest their arms while reading, or on which letters can be written if so

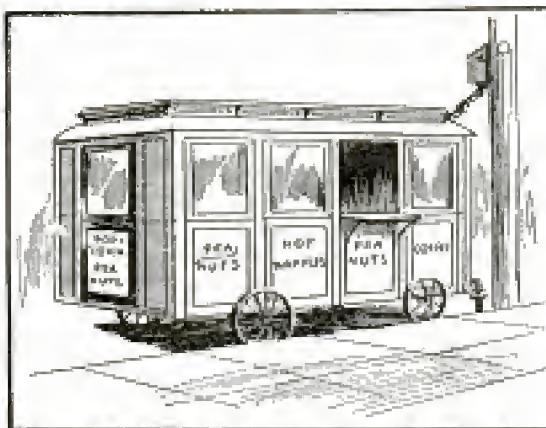


Comfortable Arm-Rest

desired, is being experimented with on a German railway. The swing is made of a board about $2\frac{1}{2}$ ft. long and quite narrow. To the ends of this are attached cords by which it is suspended from the top of the car. The rests can be raised or lowered to suit the convenience of the passengers.

NATURAL GAS AND ELECTRIC LIGHT IN POPCORN WAGON

This popcorn wagon, which stands every night on a street corner in Kansas City, is equipped with all the most advanced heating, cooking and light-

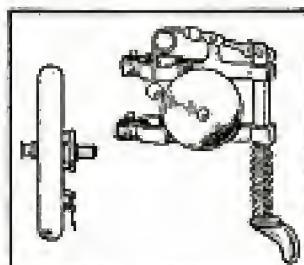


Modernly Equipped Popcorn Wagon

ing devices of the modern American home. The moment the wagon is drawn up to its stand a pipe attached to a natural gas main is run into the wagon and utilized for heating the interior, popping corn, roasting peanuts and cooking waffles. On the top of the wagon a plug connects with an electric light wire which furnishes current for lighting. Both the gas and electric meters are in the wagon.

ALARM FOR PUNCTURED TIRES

The device illustrated has been introduced to give warning when an automobile tire is punctured, and the car running on wholly or partly deflated tires. The arrangement is a bell and plunger attachment fastened to a spoke of the wheel. The moment the tire begins to get soft the plunger strikes the ground at every revolution of the wheel and so rings the bell. It is a simple matter for a driver to run a long distance on a deflated tire without knowing it, especially if he is on a well-sprung car.



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UP AMONG THE CLOCKS AND BELLS.—When the tower of the Metropolitan Life Building, in Madison square, is completed, New York will have the largest clock in the world. That distinction has belonged for many years to "Big Ben," in Westminster Abbey, London, the dial of which is 22½ ft. in diameter, while that of the Metropolitan building will be 25 ft. The clock will occupy part of the 25th, 26th and 27th floors, and will be 340 ft. above the street. Notwithstanding the fact that the clock will only be a little more than half way to the top of the tower, which will be 658 ft. above the street, it will be far above all surrounding buildings. The letters on the dial will be 4 ft. high and the hands 12 ft. long.

Among those who tend the clocks and the bells are two men who have just celebrated anniversaries in their profession. The master ringer of the chimes in Lincoln Cathedral, England, has just completed half a century of his task. During that time he climbed the stairs so often that the total of steps is 975,000.

N. T. Shore, who winds and regulates the big clock in the steeple of the Moravian church in Hope, Ind., has finished his 25th year of such duty. He has wound the clock on an average of once every 24 hours since Oct. 23, 1871, missing only one day. In winding the clock 200 revolutions of the arm are required on the striking side, and 50 on the winding side, making a total of 1,320,250 revolutions since his task commenced.

NEWSPAPER PRINTED ON BATTLESHIP.—The U. S. Battleship "Nebraska" has an up-to-date printing establishment and a monthly newspaper, edited by members of the crew. The first issue of the newspaper was run off the press Dec. 1, 1907. It is known as the "Antelope" and contains news of the navy and gossip about ships and crews. The ship's menu cards and all the orders of the day are also printed in the shop. The subscription price of the "Antelope" is \$1 per year.

HOW TO STOP A NOSE-BLEED.—When the bellboy responded to the signal he found the elderly traveling man standing in the center of the room holding a handkerchief to his nose, from which the blood was oozing.

"Give me a slip alongside the heat, good and hard," said the elderly man, turning his face toward the boy and speaking with difficulty.

"But, sir, I—don't know what you mean, sir," stammered the boy, backing toward the door.

"Don't stop to talk," sputtered the traveling man, "slap me, I tell you," again holding his head forward. The boy hesitated for a moment, then timidly slapped the man's face. "Harder!" commanded the smitten one. The boy hesitated no longer, but with his open palm dealt the man a vigorous blow.

"That's better," grunted the gory one as he removed the handkerchief and after a test found the bleeding had stopped. "I'm subject to these attacks of nose-bleed," he explained to the astonished youth, handing him a tip. "I have tried all sorts of remedies, but nothing acts more promptly than a blow alongside the head. The shock seems to paralyze the ruptured blood vessels and they quit work at once. Try it some time if you have the occasion. I got the idea from an old physician in Mexico."—N. Y. Press.



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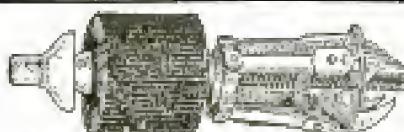
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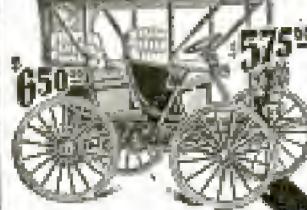
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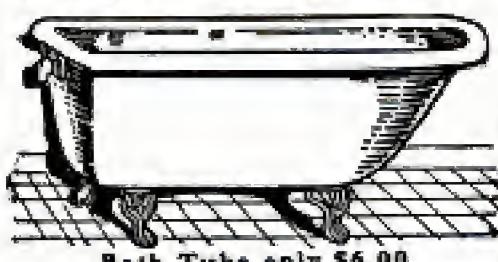
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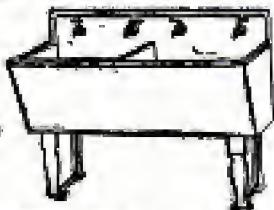
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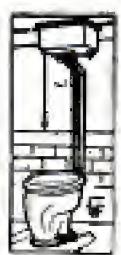
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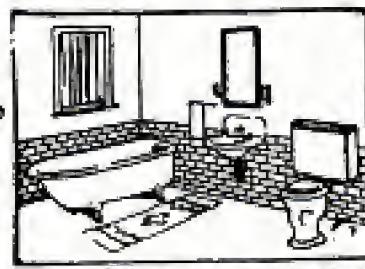


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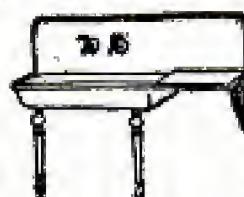
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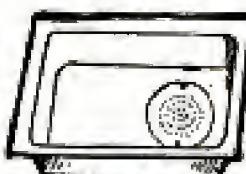


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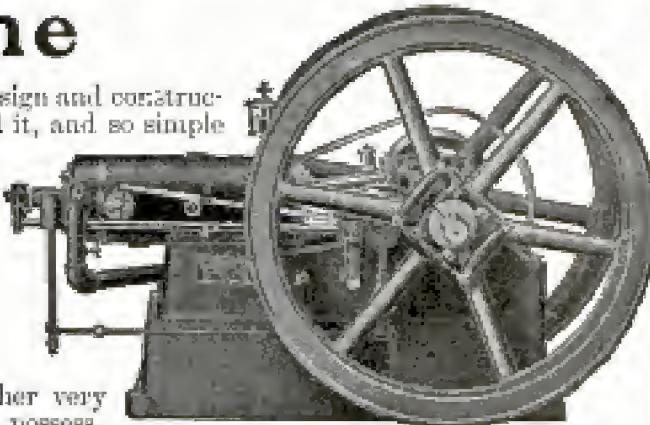
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THIS IS ON THE FIREMAN.—A man applied for a position as motorman on the trolley cars the other day, and after being shown how to operate a car was sent out alone with the instructions to stop his car whenever he saw any fire apparatus coming down the street. In the afternoon he was sending his car as rapidly as possible down Washington street, Ickton, when the warning scream of an engine whistle caused him to stop his car. He waited until the engine, hose wagon and chemical had passed and then started up his car again. Just as he got under headway a ladder truck swerved around the corner and ran into the trolley car. At the investigation the motorman was called up before the officials and asked why he had not obeyed instructions and stopped his car. "Sure, but I did not know that those crazy painters with their ladders were a part of the fire department," he replied.

He still has his position.—Lowell Mail.

THE JANITRESS AND THE CASHIER.—She walked into a branch bank on upper Broadway and pushed a check through the paying teller's window.

"You will have to be identified," said the cashier. "I don't know you, madam."

"You don't, eh?" said the woman, with fire in her eye. "Aren't you the father of the Smith family that has a flat in the Elieccim apartments?"

"Yes."

"Well, I'm the red-headed janitress that your wife's always complaining about. When you left home this morning I heard you say: 'Emily, if our children get fighting with that old fury in the basement, don't quarrel with her. Wait till I get home and let me talk to her.' Now, if you think you can get the best of an argument with—" "Here's your money, madam," said the cashier.

Some New York boys, according to the Sun, have a yell which goes like this:

Pooh, Pooh, Horray! Pooh, Pooh, Yab!

We learn our lessons through the mail!

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Rah! Rah! Rah! Correspondence Schools!

ORIGIN OF PLUG TOBACCO.—In the jury room at the court house a few days ago a farmer said, as he took a chew of tobacco:

"All the difference in the world in tobacco. I've tried twenty different kinds and none is as good as that we used to make ourselves down on the farm. We would take a maple log while it was green and bore a dozen holes in it with a 2-in. auger. They were our molds. We selected our choicest tobacco and soaked it for a week or more in wild honey. Then we'd take the leaf to the log, get a good hickory 'tamping' stick and go to work.

"A little bolt of the honey-soaked tobacco would be put in the auger-hole and tamped in with the stick and a hammer. We'd pound it in solid. Hall after hall would be rammed in and pounded until the whole became a solid plug. When the hole was nearly full we would pound in the plug and then the log would be put away to season. As the wood dried the moisture would be drawn from the tobacco. And when it was split the sweetest tobacco ever made was taken from it. We called it 'plug' tobacco, and that's where the name originated."—Kansas City Star.

WIRELESS TO SPAN THE PACIFIC.—The British Colonial office has recently made the announcement that the installation of a system of wireless telegraphy between Vancouver, Samoa, Fiji and Australia is entirely practical. It is understood that before long steps will be taken to effect the same.

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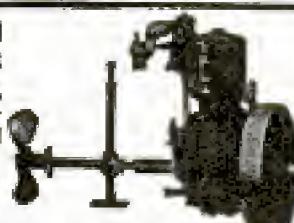
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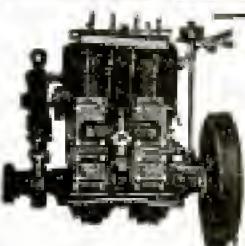


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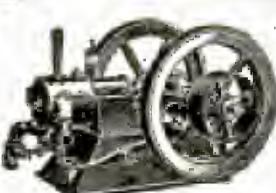
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WICKED DEMONS OF THE DEEP.—Although the shark and the octopus share about equally the reputation for being the greatest enemies to mankind in the sea, a much worse creature than either shark or octopus is the devil-fish—a large ray that is common in the warm waters of the Atlantic. The fish grows to a weight of a ton and a half, and besides formidable teeth, is armed with a horrible barbed and poisoned spike in the tail. It has often been known to attack boats. Another nasty customer is the green murena of Bermuda, which resembles a conger eel in form but is of a very savage nature. The swordfish, sought for its oil and flesh, especially along the Atlantic coast of the United States, is another dangerous creature. Swordfish are harpooned in the same manner in which whales used to be killed. Quiet enough until attacked, the swordfish then seems to go raving mad and fights with unmatched ferocity.

LETTING OFF STEAM.—Some officer had disobeyed or failed to comprehend an order.

"I believe I'll sit down," said Secretary Stanton, "and give that man a piece of my mind."

"Do so," said Lincoln; "write him now while you have it on your mind. Make it sharp. Cut him all up."

Stanton did not need a second invitation. It was a bone-crusher that he read to the president.

"That's right," said Lincoln, "that's a good one."

"Who can I send it by?" inquired the secretary.

"Send it!" replied Lincoln; "send it! Why, don't send it at all. Tear it up. You have freed your mind on the subject and that is all that is necessary. Tear it up. You never want to send such letters. I never do."

FLYING STONE IGNITES OIL WELL RIGGING.—Flying stone recently caused the destruction by fire of the rigging of an oil well in one of the western states. The well was being shot with nitroglycerine. In the customary manner, when rocks were blasted out of the mouth, striking a drill stem, and causing a spark which set fire to the gas.

NEW BOOKS.

HIGHWAY CONSTRUCTION. By Austin T. Byrne and Alfred E. Phillips, 140 pp., 80 Illus., Price, \$1.00. A complete course for road builders, landscape gardeners, civil engineers, public servants. Methods of locating, constructing and maintaining roads under all conditions. American School of Correspondence, Chicago.

BANKERS MATURITY GUIDE AND HOLIDAY CALENDAR. 1908-1909 edition. Compiled and published by Sperry & Morgan, Hartford, Conn. 32 pp., with thumb index, 50 cents.

MEN WHO SELL THINGS. By Walter D. Moody, 294 pp., Paper covers, Price, \$1.00. A work of interest to all who have anything to do with selling goods in every line and trade. Written by a sales-manager and embracing the experiences and observations of a lifetime in this line. A. C. McClurg & Co., Chicago.

THROUGH THE CHICAGO STOCK-YARDS. By John O'Brien. Paper cover, 190 pp.; Illus., Price, 25 cents. A handy guide to the great packing industry. Rand McNally & Co., Chicago.

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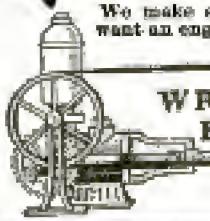
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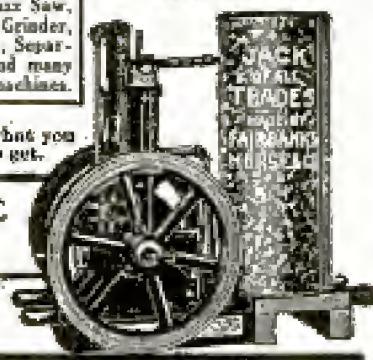
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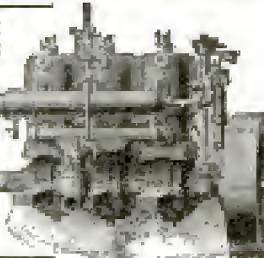
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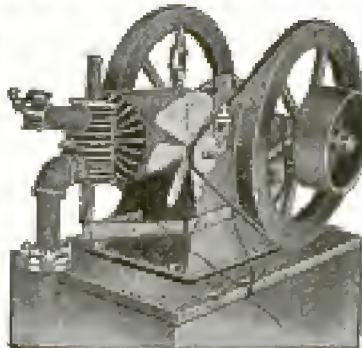
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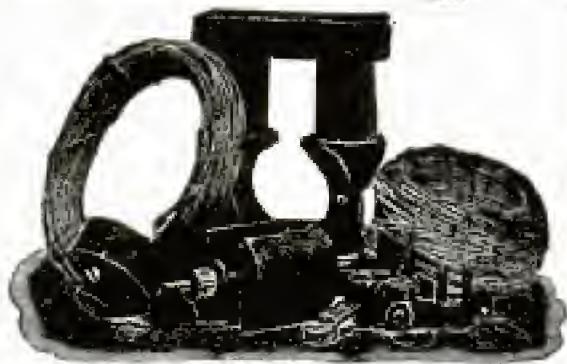
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Handsome and finished.

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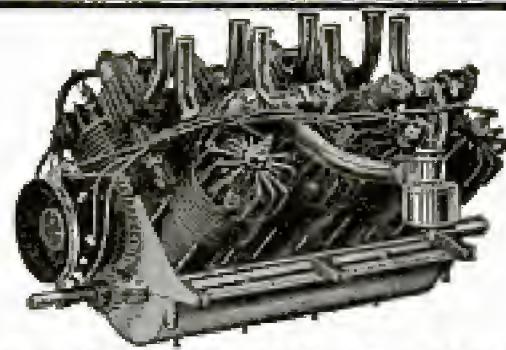
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THE LATEST DOG STORY.—A saying runs to the effect that the flesh of the boar is so delicious that Providence will wreak vengeance on those who over-indulge in this meat. The proverb has recently been verified by an incident brought to light a few days ago in Osaka. The boar season sets in with the winter, and its flesh is most relishable between now and next spring. Many salesmen go about nightly crying out "Boar flesh, all alive O!" are eagerly patronized. Yoshida Okinaga, of Nishikyo, Osaka, is a great lover of the meat, and whenever the boar season comes he is the first to eat it and seldom omits eating it at supper almost every evening in winter. He has patronized the same butcher for nearly five winters. The other day he called the salesman, named Matsutaro, and bought a pound and a half of boar flesh. At supper he was doing justice in his usual way of eating as he boiled the meat. He had devoured half when he was called on by a detective who, beholding him eating advised him in a diplomatic way that he was eating dog's flesh and that Matsutaro and several of his colleagues had been arrested on a charge of fraud. These men had been selling nothing but the flesh of dogs, which they bought from a butcher in Hyogo, whose business it is to steal and kill dogs. Yoshida felt an instant sickness in his stomach, but we drop the curtain. According to the confession of the arrested rogue, nearly all the itinerant vendors of the so-called boar flesh are his colleagues. The dog flesh is bought at about 40 yen per kg and they go about with the flesh covered in a boar's bristling fur. By selling two kg they generally realized a net profit of 4 or 5 yen.—Japan Times, Tokyo.

BURNED SNAKES FOR FUEL.—The spring crop of snake stories opens up early and unusually promising. The Philadelphia Record leads out with this one:

Men getting out bluestone above Narrowsburg blew off a top dressing of earth and stone to get at the marketable product beneath. The blast exposed a cavern which contained a tonne of snakes. They were of the blacksnake, rattlesnake and milksnake variety, and had evidently crawled into the rocky retreat for the winter. They were frozen stiff, and thrown out of the way by the workmen.

Patriot Boden, a charcoal burner, saw the snakes in a pile, and, mistaking them for wood, threw them on a fire. When they began to thaw out and writhle over the ground, he thought the woodpile was bewitched. Not so with his son and wife. They attacked the reptiles with such vigor that in the course of a few minutes they had slain thirty-six snakes.

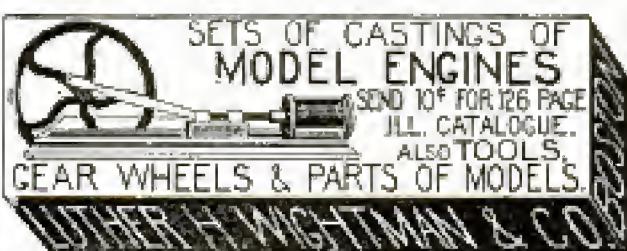
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As a dynamo, it will light four 6-c. p. lamps easily; operate induction coils; charge storage-batteries; decompose water, electrolyze, etc. As a motor, will operate sewing machine, jewelers lathe, emery wheel, circular saw, advertising devices, and other useful appliances.

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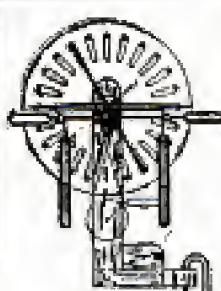
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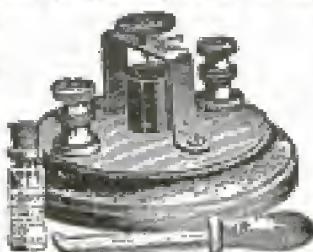
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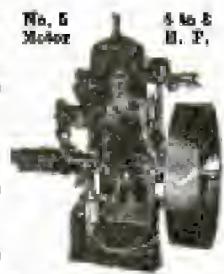
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of a Motor."



Detroit, Mich.

RULES FOR CHAUFFEUR.—An English motorist has compiled the following rules for his own driver for town driving, says Automobile Topics:

If there is a doubt whether you can "get through," don't try. Remember, if any accident occurs it is a discredit, and a bad job for someone.

Don't go too quickly near the pavement, in case a deaf person, or one engaged in other thoughts, steps off into your track. When passing a tram, face on, shout loudly to provide for a person walking across from behind the tram, who might be bewildered by the confusion. Go too slowly rather than too quickly. If you make an error, make it on the safe side.

Always remember that any needless revolutions of the engine—that is, when the engine is running light, are so many moments less life to its existence. It is an unnecessary cost of petrol, lubricating oil, and wear and tear—a noise, a discomfort, and an irritation to people and mechanism.

A revolution saved is a revolution gained. There is an economic, a durable, and a pleasant speed to an engine, just the same as there is to a living person; a speed at which a person can walk and run without destroying the tissues or over-exerting the muscles of the system, as with the piston of an engine.

And an engine working the car, and running light, is under two distinct differences. Working, the car has the flywheel power of the car; it is "locked" by a ton in motion with itself, and it is thus held "steady." Running light, it has no staying power; it has no 1-ton flywheel. Therefore, before declutching, throttle down your engine. Before starting your engine, throttle down. Before starting your car, throttle down to the extent that the engine will easily "take hold."

Never draw up with your brake if you can do so without; it is a penny wasted on tires every time you do so. Withdraw your clutch in anticipation of the place to stop at, and just bring the "stand still" with the brake. It is an act of bad driving to rush up to a stopping place and then apply the brakes.

Because it scares the people about, and the people inside may think that perhaps the brakes won't set; because it savors of a wish to draw attention and give an impression of ability, which is not becoming; because it costs as much in tires to stop by brake power as it does to start with the same quickness. In the case of starting or quick acceleration, the engine is the motive power. In the case of slowing down suddenly by brake power, the momentum (inf., say, 1½ tons) is the motive power, and the brakes are the retarding power. In both cases the tires in contact with the road surface have to communicate the power, and they depreciate accordingly.

Because the power of retarding is transmitted through the gears and reduces the life of the mechanical parts.

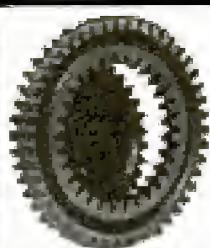
Therefore, don't use brakes indiscriminately for drawing up. They are for down-hill and emergency work.

TEST FOR COLOR BLINDNESS.—The superintendent of a railway in Indiana received the following letter from one of his men, says Electric Traction Weekly:

Montgomery, Ind.

My Inspector—Dear sir—The day before yesterday at nine I got word to come down and have me see looked after for color blindness. I had 45 ties and 10 rates to put in before the sand cut and the bands were to short to spare me. The ty that was first in me, was put out by a blow from a pick and the glass ty is a perfect figger of the ty that was not put out, and is sent to you and the watch for examination. I end spare the glass one better than the one in me head. If this is color blind I'll get one that ain't.

Anthony J. Scott, Foreman Sec. 10.



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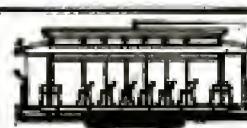
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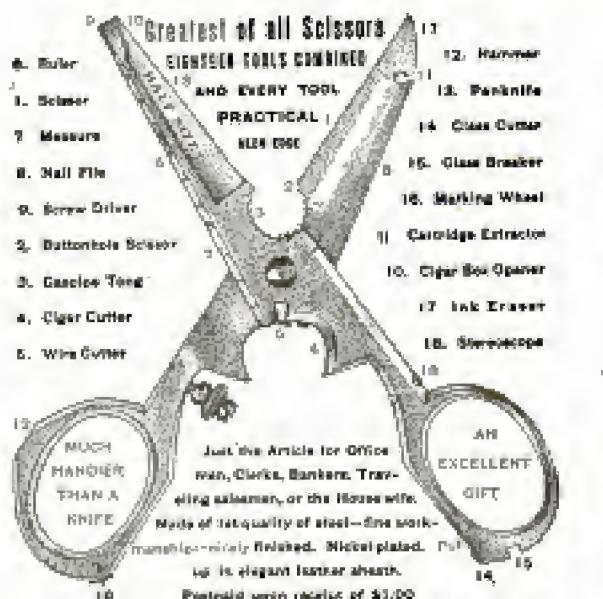
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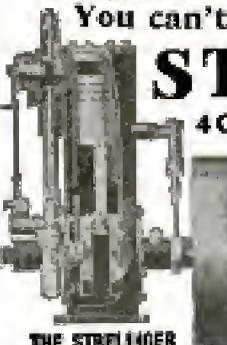
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SMALL STEAM TURBINES WANTED.—There seems to be quite a demand for steam turbines of small powers. Several times each month this magazine receives requests for information as to where the writers can obtain steam turbines ranging from 1 to 10 hp. The larger number want a 3 to 5-hp. The requests moreover are from concerns in good standing and not from unknown individuals.



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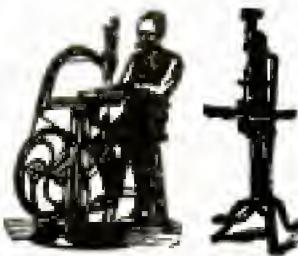
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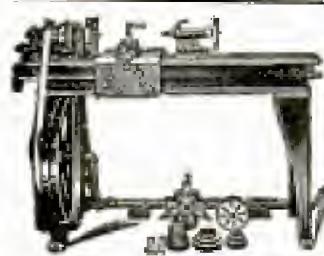
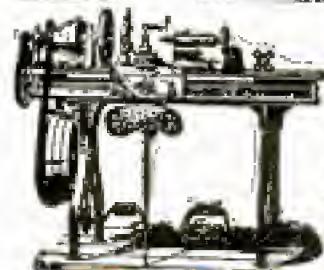
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IMPRESSIONS OF A LOCOMOTIVE ENGINEMAN.—When I started railroading an engine cab was to me as Fairytale, a sort of sacred and mysterious place to be entered with awe. The smell of cylinder oil—that smell which is ever present on an engine—was as incense to my nostrils, and the odor of a torch had its charm. I was a night boiler helper and the engine then burned coal—I know this for I shoveled it the first half of every night. The other half was devoted to wiping and cleaning fire and front ends.

But if I was pleased with my job then I was infinitely more so when sent out as an engine watchman, to watch a work train engine near Albuquerque. There were five of us watchmen at this point, and we worked hard, for the coal we had was very low quality and the tires to clean were frightful. But we toiled cheerfully, and around those nights memory clings with tenderness. Two of us are now engineers, one has quit railroading, one has passed to the great beyond and I do not know where the other is now.

At that time I was not up to the standard in weight and had considerable difficulty in getting onto the list of firemen. But I was finally given a switch engine to fire, thanks to the efforts of a roundhouse foreman in my behalf, and from that to road fireman was a short jump. I have fired for many engineers since that time; and I must say that they were all fine men, though some had their faults and some were better than others. I venture the assertion that in no body of men are opinions on small matters incident to their profession so diversified as among locomotive engineers, and an extra fireman finds this out. A certain way of carrying water, of sanding the flues, of managing the fire, which pleases one man will not meet with the approval of another.

But how different many things seem to me since penning the right-hand side. The element of professional pride enters greatly, and I became possessed of the determination to be a man who knows his business, for I have ever admired such men in any profession anywhere. To be a successful runner, with the minimum amount of delays and failures; to use my allotted supplies without wasting any—for I have always held that a thing wasted does me one any good; to see that the fireman does his work properly, yet instruct him in such a manner that I hold his respect; to work harmoniously with the train crews, between whom and the engine service there is frequently a certain amount of needless friction; these are the things I would like to attain. And the sense of responsibility weighs heavily, filling me with a certain seriousness hard to describe. All enginemen feel the weight of it, though they may not say so.

Still there is a charm about it, of working in all kinds of weather, of moving along under the stars and beholding the beauties of the night, of gliding past farmhouses and fields bathed in the moonlight or seeing meteors flash across the sky, of working in stormy weather when the wind and rain cut your face like knives if you put your head out of the cab, once in a while catching the roar of the exhaust above the sound of the storm, while the lightning flashes and the thunder rolls. And we have fog, too, when you cannot see more than two car lengths ahead, and the word "if" is ever present in your mind. Again, the conditions to be met are never alike on any two trips, and this calls for a constant display of watchfulness and judgment. Our hours are irregular, and many times long. Day and night is a continuous stretch of time to an engineman, with enough interval between trips to obtain needed rest.

There is no other trade or calling similar to railroading. It stands alone. I would advise those who envy the men in the cab to pause and consider. All is not roses in the life of an engineman, entitling us to do working under any and all conditions. And, to those who are possessed of a prejudice against railroaders, I would say that the majority of them are men of fine character, very much human, possessed of large hearts, most of us with homes of which we are proud and in which culture and refinement are found.—E. H. H. in Santa Fe Employees' Magazine.

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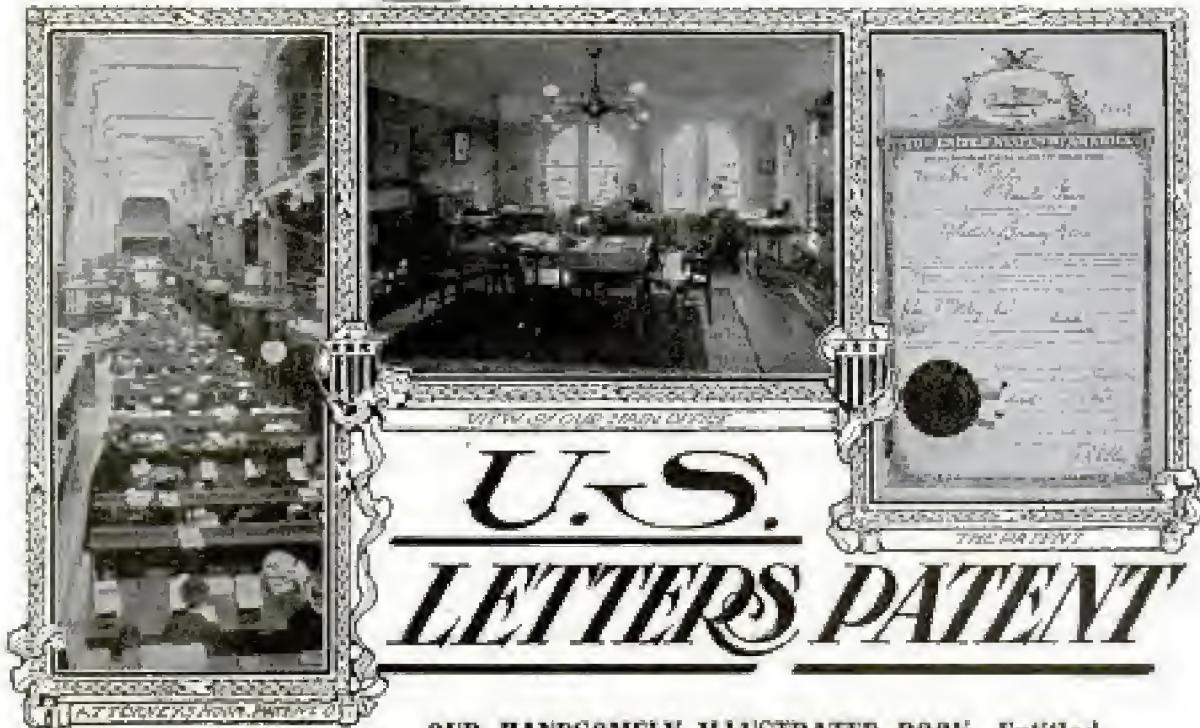
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PAID CAR FARE WITH BREAD.—A passenger on a Marion-Gas City car, at Marion, Ind., gave an exhibition of what may be done in the time of financial stringency. The passenger in question was carrying six loaves of bread when he boarded the car. Subsequently the conductor asked him for his fare, which is five cents between Marion and Gas City, and he found he did not have a cent. A bright thought of applying the asset currency idea struck him and he handed the conductor a loaf of bread. The conductor cheerfully accepted the bread and the passenger was carried to his home in Gas City.—Electric Traction Weekly.

STAIR-BUILDING AND THE STEEL SQUARE. By Fred T. Hedgpeth and Morris Williams. 130 pp., 180 illus. Price, \$1. Complete instruction. The entire process of stairway construction is here explained by easy stages. The section on The Steel Square is a complete guide to the many uses of this versatile tool. American School of Correspondence, Chicago.

GIVES HIS LIFE TO SAVE TOWN.—The business section of the town of Naucatl, Mexico, owes its existence to-day to the bravery of the Mexican engineer of a burning train in which there were two cars of dynamite. While the train was standing at the depot in the center of the town a blaze was discovered in a box car adjoining one of the cars of dynamite. The engineer, Jesus Garcia, rushed to his engine and pulled the train out of the town. Less than a mile out the dynamite exploded, blowing the engineer to atoms.

ORE SHIPPING SEASON BREAKS ALL RECORDS.—From the opening of navigation, April 22 to December 1, 1907, the total shipments of iron ore from the Mesabi and Vermillion ranges in Minnesota, was 29,345,000 tons, an increase over 1906 of 3,458,781. This is the largest shipment ever sent to the ore docks at the head of the Great Lakes in the history of the two ranges. From the Mesabi range was shipped by far the greater amount, its portion being about 27,000,000 tons. This breaks the world's record for one season's shipments.

WATCHES SET IN FINGER RINGS.—The latest fad of society women is the wearing of the watch over one of the gloved fingers of the right hand. These tiny time-pieces are attached to ordinary gold finger rings and seem likely to prove popular, for not only do they keep time but they are always in view of the owner and the possibility of losing them is diminished. In addition to the safety which the new fad insures, the watches look exceedingly cute on a well-gloved hand. The fad originated in England.—The Keystone.

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WHAT AN OBSERVER SAW.—I saw a bakery proprietor behind his counter with his hat on and a squirt of tobacco juice on his beard. He should have been carrying the horse.

I saw the head of an establishment sweeping out the store the other day, a job that a boy at three dollars a week could have done better and left the boss a chance for a few "thinks" about his day's business. This boss has been doing this for twenty-five years, and is still making boy's wages.

I saw a baker's ad in one of the daily papers recently in which he was represented as sitting in his office like a banker and looking as pleased with himself as the manager of the street railway. People have since been wondering whether it is better to bake bread or own a gold mine.

I saw a bread wagon on one of the streets the other day with the name of a prominent baker that looked as though it had been superannuated and the city dog catchers had taken it over.

I saw a man talk to one of his employees like a dog, and I said that fellow is a sort of a mean dog himself or he would not snarl like that.

I saw a small-sized shop without any pretensions to elaborateness that was the best equipped for its size I have ever been in. What struck me was the conscientious, cleanliness and thoroughness of the whole place. There were no frills and evidently everything in the place is made to do its part well. The good things are not all in the large shops.—Canadian Baker and Confectioner.

PERVERTED PROVERBS.—The engineer is worthy of a higher hire.

A rolling stone gathers no cement.

A touch from a live wire is breakfast for a coroner.

A survey goeth before construction, and a power plant before a fall.

Too much anchor-ice breeds instant.

The flat wheel makes the greatest sound.—Power and Transmission.

BLEEDING THE COMPANY.—"Did you get anything from the claim agent, Bill?"

"Yes; \$25 for me and \$25 for the misses."

"I didn't know the misses was hurt."

"She weren't; but I had the presence of mind to fetch her a good one on the head with me boot. Her face looked bad, and the company paid."—Express-Gazette.

FISHERMEN'S GOOD LUCK.—A great haul of cutlassfish, numbering more than 800,000, was made in one night a few weeks ago off Uwajima, Iyo province, Japan. The catch was valued at \$1,000.

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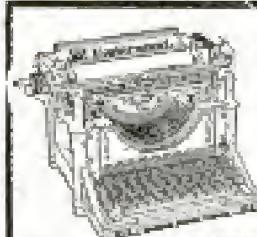
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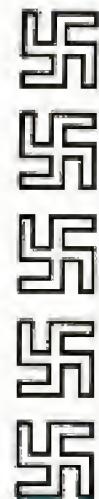
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The man behind his fist,
The man, alas! behind his rent,
And so throughout the list,

But they've skipped another fellow,
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Than the man who is behind.

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Are indebted for existence
To this honest fellow-man.

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And the town is never dead;
And so we take our hats off
To the man who is ahead.

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A "HOLY TERROR" STEAMER IN THE HANDS OF JIM SKEEVERS.

By John A. Hill in Railway and Locomotive Engineering.

Skinny Skeevens, one of the object lessons, ran Mike Moennihan's engine for a long time, while Mike went to visit the "ould sod," and Skinny's engine got a new firebox and a coat of varnish.

The first time Skinny oiled around, he yelled up to Patsy Killigen, the fireman, to put on the injectors, and coal her off, so he could see the oil holes; she was boiling so it gave him the blind staggers.

"How does she steam, Patsy?" asked Skeevens, as they started out.

"She's a 'holy terror' for wind," said Pat, proudly. "She's always crazy wid it."

Skeevens was somewhat annoyed at the constant howl of the pop, but it did little good to speak to Pat--Pat fired by the pop, and a "holy terror" was his ideal.

Skeevens thought he'd try an object lesson.

"What size nozzle has she got?" asked Skeevens.

"Oh, Lord! you ain't agoin' to go monkeying with her nozzles, are ye, Skeevens? They are 2½ or 3-inches now."

"She burns too much coal, and howls too much."

"There ain't another steamer like her on the road," moaned Patsy. "Why, you can't shut off her throttle, but up goes her white tail--steam! Why, she's the darlin' of em all, Skeevens."

Skeevens got a smaller scoop, but Patsy piled it indomitably, and the "90" still held the first prize as a "holy terror" for steam.

Skeevens helped the coal shoveler to put on a tank load of lumps, none to weigh less than 200, but Pat paralyzed the lumps and reported the coal shoveler beside.

Skeevens thought of putting a flat car between the engine and tender, but gave the idea up as impracticable.

Patsy would put in a fire within two minutes of a regular stop, and be happy when the black smoke rolled, and the white feather stood proudly up 48 ft. above the bawling pops of the "Holy Terror." Skeevens was in despair.

"Pat, did you ever stop to think that you are shoveling a lot of coal through that pop for nothing?" he asked.

"I don't mind the work, Skeevens," said he. "Don't mind it a bit; it makes the other lads green wid envy to see how she do steam."

"But it wastes coal."

"Please ye, me boy, the company own their own mines, and it's proud they ort to be to have such steamers."

Skeevens couldn't get Patsy mad, and could awaken no other feeling in his heart but worshipful admiration of the prolific steam production of the "Holy Terror."

(Continued on page 126.)

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A Startling Discovery That Will Revolutionize the Physical Condition of Mankind

Why Remain Short and Stunted When You May Learn Free the Secret of How to Grow Tall?

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No new discovery has attracted more attention in the scientific world than that made by K. Leo Minges, of Rochester, N. Y. Mr. Minges is to short men and women what the great wizard, Edison, is to electricity. He has gathered more information relative to bone, muscle and sinew than anyone else in existence. Making people grow tall has been a hobby with Mr. Minges for years, and the results he has accomplished are startling to a high degree. By his method every man or woman not over 50 years of age can be made to grow from two to five inches in height, and anyone older than that may increase his height perceptibly. His method has the endorsement of leading physicians, and several prominent educational institutions have adopted it for the better physical development of their pupils. If you would like to increase your height you should read the book which tells how this remarkable discovery was made and reveals to you the secret of how to grow tall. It is free. You are not asked to spend a single cent and if you desire it we will send you the statements of hundreds who have grown from two to five inches in height by following this method. The results are quickly accomplished. Many have grown as much as three inches in two months. There is no inconvenience, no drugs or medicines or operation. Merely the application of a scientific principle in a perfectly hygienic and harmless way. Your most intimate friends need not know what you are doing. All communications will be sent in plain envelopes. The book C, "How to Grow Tall," contains illustrations that will interest and instruct anyone. One thousand of these books will be given away absolutely free, postage prepaid, while the present edition lasts. If you want to grow tall, write today, in strictest confidence, for a free copy. Address The Cartilage Co., 10 E. Unity Building, Rochester, N. Y., U. S. A.



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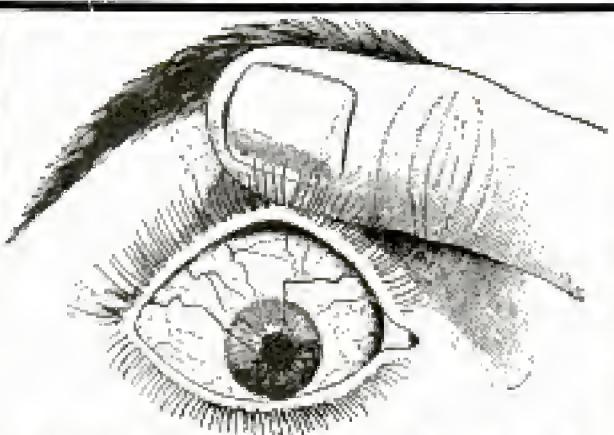
in most cases. For weak eyes they are crutches—not a cure. For diseased eyes they are useless. Only a gentle medicated massage can strengthen weak eyes and cure optical diseases. The

NATURAL SIGHT RESTORER

applies a soothing, strengthening treatment that is healing but harmless; gently exercises the proper muscles and makes weak eyes strong by proper massage. Brings eye-health by aiding nature. Young or old treated at home and normal eye-sight secured for the cost of a pair of glasses. Don't wear "specs," but write today for our free illustrated book. If we can't help you, we will say so.



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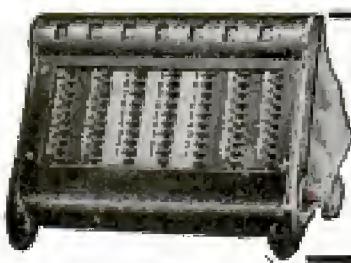
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Does the work as accurately as any Machine at any price. Special offer to Agents.

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Continued from pa. 6 124

The run was a light passenger one, and after some scheming Skeeters got Pat on the "Holy Terror" on heavy freight run for a week. Skeeters managed to see all the steam that was made on the road, but Pat insisted on a pop solo at every stop.

Skeeters hated to disturb the front end adjustment of another man's engine; he finally determined to enlarge the nozzle, but concluded that this might give them trouble on the road, and besides that, Skeeters didn't believe in patching an engine to repair a man, nay more than he believed in feeding a fireman extra coal to keep scale out of a boiler.

But right here the road got a new master mechanic, and the very first month he put up a bulletin of the amount of coal burned on each engine, and the "Holy Terror" was away down in the middle of the passenger engine list.

Pat was pretty mad about it, and said, If they would figure on who made the most miles or the most hours with the steam pressure at or above 140, he and the "Holy Terror" would take first money.

The next month he stole a few lumps of coal, gave the shovellers cigars for big measure, etc., but the bulletin appeared again with the "Holy Terror" advanced but one point.

Then came a bulletin notice that firemen would be promoted on merit, especial preference given for a coal record.

Pat had a nightmare that night when he thought of the "Holy Terror" and himself at eighth place, and Jim Bean, who was fired four months after he was, leading the list for coal—and promotion.

That evening after they got to going up the hill, and the pop sat down to rest a minute, Skeeters called Pat over, and, in a friendly way, told him that the Old Man had said he should have to promote three or four men in the fall, and that he was afraid that Pat would lose his chance and see a lot of younger fellows pass him, if he didn't mind. Skeeters suggested that the main trouble was with the "Holy Terror," and not Pat, and proposed that they prove it to the Old Man by having Pat transferred for one month to the "94," that was then leading the coal burners.

Pat agreed to this if Skeeters would arrange it—he didn't know that Skeeters had arranged it.

When the next bulletin came out, the "Holy Terror" was at the head, and the "94" was fifth. Pat was improving some.

Pat was glad to get back with Skeeters and the "Holy Terror"—said Old Man Martin on the "94" kept "picking at him" about opening the door and monkeying with the dampers.

Jimmy Bean was sent to running switch engine in a week or two, and Paisley's heart was broken.

"Skeeters," said he, "I'm disgraced. What the devil is the matter with the '94,' or—oh—me?"

"The '94' is, without a doubt, the best engine on the road, Paisley," said Skeeters, "and honestly I think you are the best fireman, or rather would be the best, except that you haven't figured out plainly just what you are trying to do—you don't realize what you burn the coal for."

Continued on page 128

Build Your Own Boat Brooks Build Your Own Furniture BY THE System



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I will sell you 100 cents' worth of actual value and results for 25 or 35 cents. Is it worth considering?

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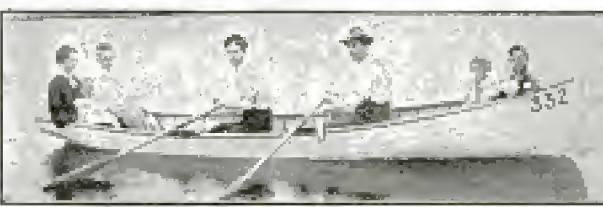
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Send for my engine catalogue—it's free. Save money by getting our special combination prices on all sizes of engines and frames when bought together.

Write me personally for my boat, engine or furniture catalogue, whichever you want. Sent free. C. C. BROOKS, President.

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for suitable raw material.

Every piece of knock-down frame is accurately shaped and machined ready to put together.

I also send free the patterns and complete illustrated instructions needed to finish the boat. I can save you (1) boat-builder's profit, (2) labor expense, (3) big selling expense, (4) seven-eighths freight. You can figure this out yourself.

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I have adapted to furniture practically the same idea that made my boat business such a success, and it is revolutionizing the furniture business. My high-grade, heavy art furniture is fast taking the place of the expensive factory product.

I have been selling this furniture for three years. Every customer is enthusiastic over it.

All pieces are solid oak and are machined, smoothed, fitted all ready so any one can put them together. You can make a beautiful Mission or Art and Craft chair, davenport, table or bookshelf in a few minutes. Apply the stain (only one coat—no rubbing) and you have a solid and handsome piece of furniture. Every piece and every result is guaranteed to be satisfactory in every way, or money refunded.

You save (1) in the factory cost, (2) in the factory profit, (3) all dealers' profits, (4) two-thirds of freight, (5) finishing. As she received it, expense, (6) the expense of crating and packing—making savings of two-thirds or three-fourths, according to the piece.

\$4 buys this chair (shown in cut) without cushion. Settee same style \$7.00. By the Brooks System you can own \$14.00 chairs for \$4.00; \$35.00 davenports for \$7.00; \$12.00 porch swings for \$1.00; \$80.00 tables for \$8.00, etc.

\$6.00 Buys this Morris Chair



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Write for Booklet H. It Will Pay You.

THE AKRON TRUSS COMPANY, Akron, Ohio

Airship Stock Pays Well

Master Cromwell Dixon, 14 years of age, the youngest aeronaut in the world, has already booked a large number of engagements for the coming summer. He made a flight last October over St. Louis at an elevation of 1,200 ft. and traveled across the Mississippi, landing 8 miles distant in Illinois. This was during the International Balloon Race. He ascended in his "Sky-cycle," made by himself and propelled by foot power. He now desires to build a much larger airship, equipped with mechanical power, and for this purpose a stock company has been organized and a limited amount of stock is offered for sale at \$50 per share. The profits on his few exhibitions last summer and the engagements already booked, make certain the payment of large dividends on this stock.

For full details, address his mother—

MRS. CROMWELL DIXON
221 West 11th Avenue, - Columbus, Ohio

(Concluded from page 126.)

"To make steam, of course," said Patsy.
"What do you want of the steam?"
"To pull the cars of course."
"Where do you put it for that?"
"Into the cylinders, surely."
"Suppose you have more than you want?"
"Out of the pop she goes—can't hurt nothin'."
"But the coal pile?"
"Coal pile?"

"Yes, don't it take as much coal to make steam to blow through the pops as it does to make the same amount of steam to be used in the cylinders?"

"But there don't much go out of the pops."

"That's where your mistake has been, Patsy. Pop Martin told me this morning that if he had all the steam that the '96' made and wasted at the pops while you were on her, he could make four round trips without coal or water."

Pat put in a fire and gave a big lump a few vigorous whacks with his coal pick, and then came back.

"I've a notion to quit, Skeevens," said he.

"You fire this engine the bout you know how for another month, take my advice, and if she don't head the list, I'll quit," said Skeevens.

"You want to remember that in barking steam to throw away, you not only waste fuel to make it, but you waste water. Water is cheap, but it takes coal to haul it around, and the '96' takes more water than the other engines do, and hauls many tons of it a month for nothing; then we have to stop for water oftener, and that takes coal—takes coal to stop and coal to start."

"Coal to stop! How d'ye make that out?"

"There you are again, Pat; you see you haven't figured on your business or followed cause and effect up very much. Don't you know that it takes just as much power to stop a train, leaving out friction, as it does to start it?"

When you set the brake it commences to use up and lose 'stored energy' that has been put into the train by the coal, through the medium of the cylinders,

"Then your brake will use more steam to get its pressure back again, and the '96' will get rid of more coal to get the train back into motion, and use more to haul the extra water. It all counts, Pat, because we do this all day, every day in the month; if it was only once it wouldn't amount to much. Think about your work, and figure on how little you can do in the way of coal shovelling to get this train over the road, and I will bet on the result."

Last Thursday the new bulletin was put up. The "Holy Terror" stood at the head, and Patsy Killigan intimated "Comrades!" as he was polishing the hand-rail in the round-house, when the Old Man came along, touched Pat's leg with his umbrella, and said:

"Come into the office after dinner—I want to talk with you."

TALES OF LOFTY TUMBLERS.—The "Irony of Life" was strikingly illustrated in the newspapers the other day when one read, in the same column, of a rustic who slipped from a 6-footed gate and broke his neck, and of an Italian aeronaut who fell 1,000 ft. with his collapsed balloon with no worse result than a sprained ankle.

It is not long since a French lady, Mme. Morel, and her daughter, while climbing in the Alps, near Zermatt, fell a distance of 1,200 ft., not much less than a quarter of a mile), and, although the mother was killed on the spot, her daughter escaped with a few bruises. Mr. Whymper, the famous mountaineer, had a similarly miraculous de-

(Concluded on page 130.)

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Don't Know Where to Find It,
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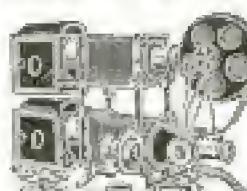


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USE KEROSENE WITH

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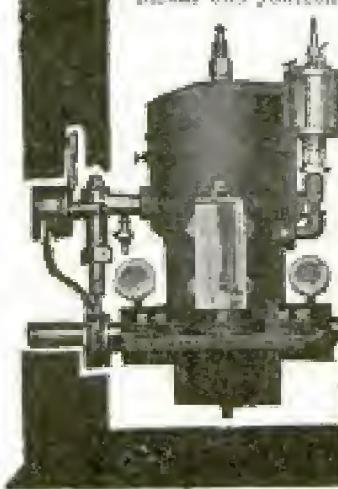
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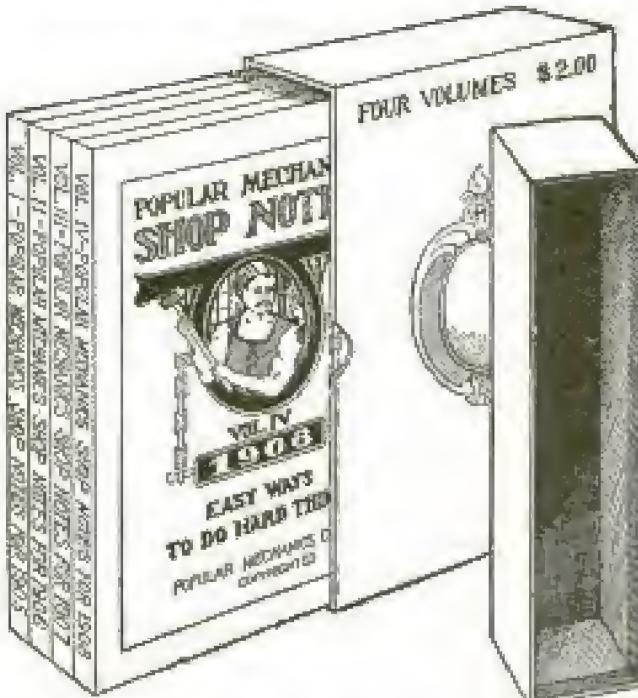
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Very truly yours, H. W. BENJAMIN,
5253 Prairie Ave., Chicago.
E. B. STOLZ, Mgr. Dear Sir: I
got so deaf I could not hear with
my speaking tube and was advised
to try the Electrophone. After fifteen years of deafness, discomfort
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NATIONAL STAMPING & ELECTRIC WORKS
153-159 South Jefferson Street, CHICAGO, ILL.

(Concluded from page 228.)

Iverance from what seemed to be certain death when scaling the Matterhorn a few years ago. Losing his footing, he fell from rock to rock to the bottom of a precipitous gully, 100 rd. in depth, only to recover his feet with no worse damage than a badly cut hand.

While climbing a waterworks tower 240 ft. high in Chicago not long ago a steeplejack called Sutherland dislodged a ledge stone and was precipitated to the ground from a height of 175 ft. fortunately striking the telegraph wires 40 ft. above the street and thus breaking his fall. The spectators gasped with horror as they saw the man drop swiftly to destruction; a rush was made to pick up his shattered remains, only to discover that he was practically unharmed. Not a bone was broken, and a week later he was walking about as if nothing had happened.

More remarkable, and, indeed, almost incredible, was the experience of Charles Woolcot when he was making a parachute descent in Venezuela. At a height of 8,000 ft. Woolcot lunged himself off his balloon into space, when, to the horror of the thousands of onlookers, the parachute failed to open. The man dropped like a stone with terrible speed, until, when about 200 ft. from the earth, the parachute flew open, and at once collapsed. He was dashed to the ground, his right thigh and hip were badly broken, both ankles and knees were badly crushed, and his spinal column was dislocated. And yet, after a year spent in a hospital, Woolcot was restored to soundness of limb after surely the most terrible adventure of which any man has lived to tell the story.

But it is in the history of ballooning that one encounters the most remarkable cases of sensational drops from the clouds. When Mr. Wise, a famous aeronaut of seventy years ago, was once making an ascent, his balloon exploded at an altitude of 13,000 ft., and began to drop swiftly to the earth, more than a couple of miles below. "The descent at first was rapid," Mr. Wise writes, "and accompanied by a fearful moaning noise, caused by the air rushing through the network and the gas escaping from above. In another moment I felt a slight shock, and, looking up to see what caused it, I discovered that the balloon was casting over, being 'neely doubled in, the lower half into the upper.'"

The balloon had, in fact, formed itself into a parachute; and, oscillating wildly, continued its descent until it struck the earth violently, throwing the aeronaut 10 rd. out of his ear. "The car had turned bottom upwards, and there I stood," says Mr. Wise, "congratulating myself, the perspiration rolling down my forehead in profusion."—London Tid Bits.

IT PAYS THE FARMER TO HAVE A TELEPHONE. The telephone has become as great a factor of farm life as the harvester and reaper and other labor-saving devices that contribute to the farmer's prosperity. The farming implements help prepare the crop for market, but without the telephone the farmer cannot sell the crop to the best advantage. His handcart used to be that he was too far away from all agencies of business, now the agencies of business are no farther away than the telephone box on the dining-room wall.

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Q Talk it over with yourself. Confront yourself with your future prospects—your present position, and the positions that hundreds of your former fellows now occupy. Isn't it worth a few hours a day to get into step once more with your old associates who have got out of the line? Isn't it worth a little effort to break away from the binding influence of poorly paid work that offers nothing in the future and little enough in the present?

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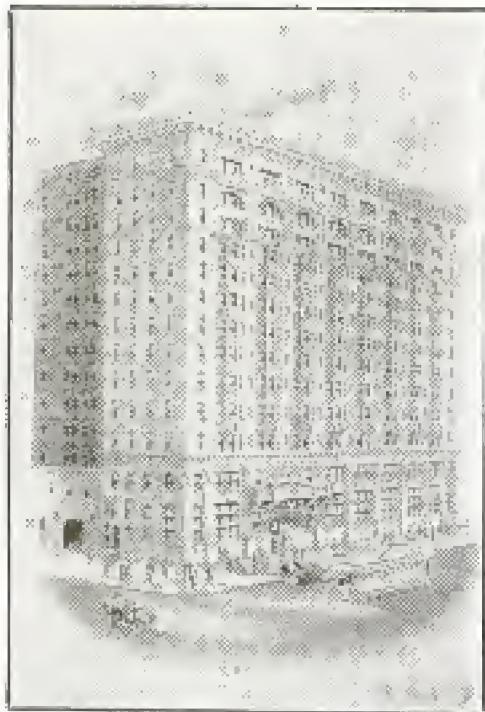
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INDUSTRIAL EDUCATION NECESSARY IN SCHOOLS.

The National Society for the Promotion of Industrial Education, at its recent conference held in Chicago, adopted a resolution providing for the creation of a commission of ten members to consider and report on the relations of industrial training and the public school system. During the week's conference educational men from all parts of the United States spoke on the shortcomings of the present school system, in that the student is not prepared in any way for skilled work in manual labor, and on the best means of bringing about the required changes.

The keynote of the conference was the need of teaching youth how to make a living. Many of the speakers maintained that the high schools are maintained by the people for the people and not as preparatory schools for colleges, and that 90 per cent of those who pass through the elementary schools go into a life of manual labor with no preparation for the performance of skilled labor. Not only does the society believe that the elementary and high schools should teach skilled handicraft, but that each state should support trade schools.

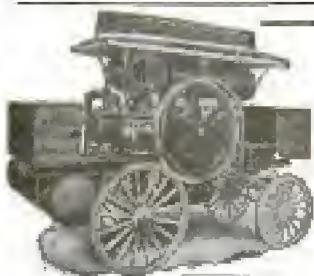
FAVORS A BIG NAVY.—That there will eventually be a conflict between the yellow race and the white race that will shake the earth is the opinion of Justice John Marshall Harlan, of the United States Supreme Court. In an address before the Navy League of the United States last week, this eminent jurist, according to The Washington Post, said:

"If I had the opportunity I would vote for an appropriation of \$50,000,000 a year for a period of ten years for a larger navy. The great importance of a navy is shown in the constitution, which restricts the appropriations for the army, but sets no limit for those for the navy. There is no such thing as friendship between nations as between men. Nations make no sacrifice to preserve friendships and do not forbear to do certain things because they do not meet with the approval of another nation. Do you think England cares a cent for what we think of her navy? Or Germany cares a cent for what we think of hers?

"How large a navy ought we to have? That is a question I cannot answer any more than whether a hospital ship ought to be commanded by a naval officer or a surgeon. I don't care how large a navy we have, but I want to see a navy large enough to take care of the Pacific and Atlantic oceans and our ports on those oceans.

"The trend of the immigration of the white people in the past has been from the east to the west. There has been none from the west. Just across the water there is a country with an immense population whose commerce we are seeking. We refer to the people of Asia as the yellow race. There are 400,000,000 Chinese, as strong physically and mentally as we are.

"There is over there another nation whose people are progressive and ambitious. We may some day see a skilled army in Japan of from 5,000,000 to 10,000,000. They will say: 'You claim Europe as your country. This is ours. Get out!' I don't think they have any such idea now, and we have no hostility toward them. But there will be a conflict between the yellow race and the white race that will shake the earth. When it comes I want to see this country have a navy on both oceans that will be strong enough."



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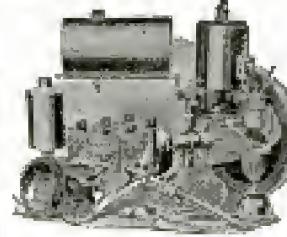
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CROSSING THE EQUATOR.—When the "Battle" fleet crossed the equator on its way to the Pacific more than three-fourths of the crew of 14,000 men experienced their first shave at the hands of Neptune, and although they did not overly relish the treatment received from the monarch of the seas, they took the fun with the best of grace and were thankful to receive the certificate of initiation which in the future will place them among the tormented, not the tormented. It is a time-honored tradition in the navy that a sailor crossing the line for the first time must be shaved by "Neptune Rex." The origin of the custom is wrapped in mystery and it is difficult to find any seafaring man who knows it by a more comprehensive name than "Initiation." Ships generally try to reach the equator at noon, and Neptune pays each ship a preparatory visit the night before reaching the line, and this is the way it is done:

A half is heard, apparently a hundred yards from the bow: "Ship ahoy!" The officer of the deck on the forward bridge replies "Aho!" and who may you be?" The reply comes "Neptune Rex, monarch of all the seas." "Come aboard, sir," says the officer courteously, at which invitation Neptune climbs on board and is met on the quarterdeck by the captain or the admiral, to whom he presents a bag of fish and a warrant of summons to be served on the unfortunate members of the crew whose names he has not yet placed on his rolls. Then with many bows and interchange of cordial compliments Neptune goes over the bow again, after informing the captain of his intention to return the following day with all his court, and having received the officer's assurance that everything would be ready for his reception.

The following day the ship crosses the line and shortly after the engines slow down and Neptune comes over the bow, accompanied by his wife, clerk, barber, doctor, tears, and policemen with studded clubs with which to belabor the victim who may show fight. Neptune is attired as grotesquely as possible and in an elaborate degree according to the ingenuity of the crew, and of late years the ceremony has been attended by a showing of splendid costumes and luncheons never dreamed of by the older man-of-war men. Neptune and Amphitrite wear crowns. The barber carries a bucket and a whitewash brush and a razor usually made of wood or a barrel hoop. Preparations on deck had already been made, there being a large canvas basin filled with water, spilling line, etc. The clerk opens his books, using a coil of rope as a desk, and Neptune calls out the names of the victims, and one by one

(Continued on Page 196.)

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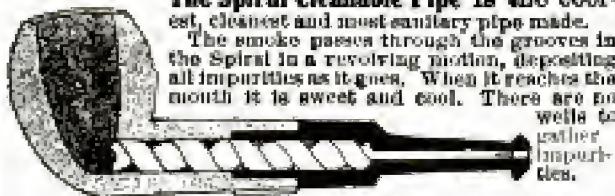
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(Continued from page 134.)

they go through the ceremony to the delight of the audience which crowds the rails, turrets, bridges and tops. If a man foolishly hides himself away the policeman goes after him and whisks him so that he wished he had remained to take his medicine. A victim is seated on the edge of a platform, and when he opens his mouth to answer a question a large unwholesome pill made of soap, pepper, etc., is inserted in his mouth. Then the barbers gets to work and bathes him, using the whitewash brush, and covers his face and clothes with a composition of sand, molasses, flour, salt, and anything that will make a disagreeable mess. With a final shove the almost tortured goes backwards into the tank where the seafarers are waiting to welcome him, with brooms and swabs and a hose of running sea water. No matter how roughly some of the men may be used, none ever thinks that the trouble is not worth while the pleasure experienced when the certificate of initiation is handed him by Neptune after the ceremonies. The officers are not exempt from the initiation, and sometimes one will be found who prefers the real experience to paying a forfeit of wine, beer and cigars. Every dog has his day, and so has the enlisted man, for from the time Neptune's flag is hoisted to the truck until pipe down after the ceremonies there is no restriction upon nor reasonable amount of fun, and rank is not excused from the good-natured though respectful pranks of the petty officers and men.—The Blue Jacket.

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(Continued on page 138.)

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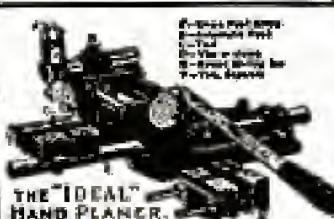
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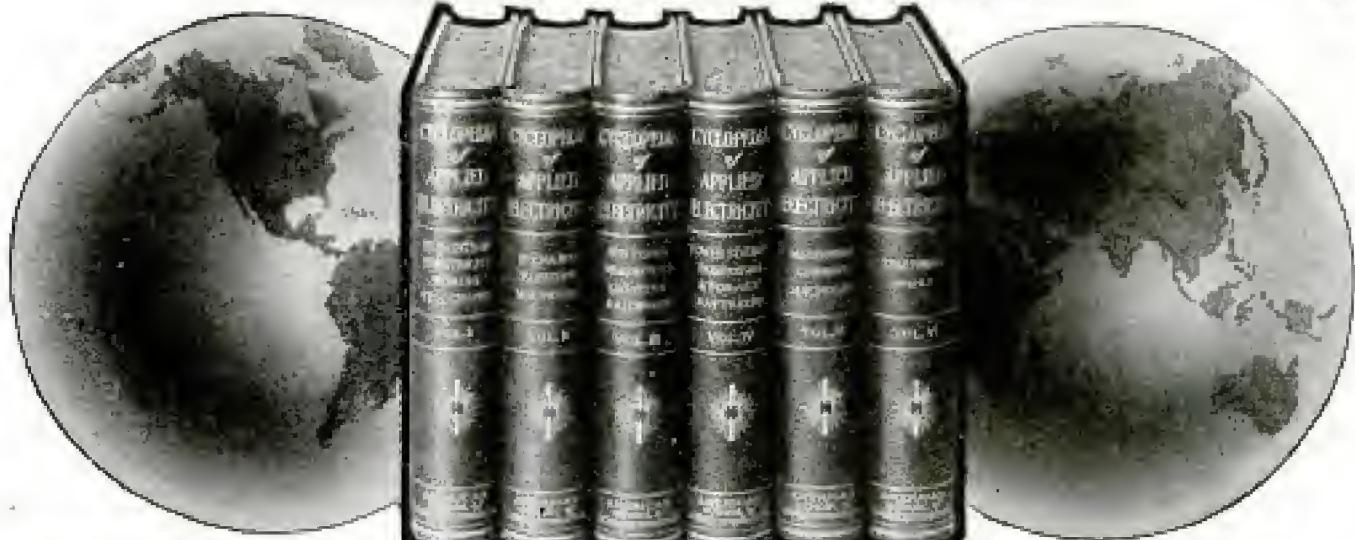
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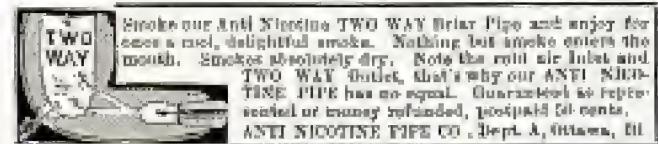


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Continued from page 136.

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WIRELESS TREATY RATIFIED.—The treaty proposed by the international conference held in Berlin recently has been ratified by Belgium, Denmark, Mexico, Norway, Holland and Romania. Great Britain, Argentina and Brazil are ready to ratify it, and France is only awaiting the action of Great Britain. Bills are now before the United States Senate and the German Reichstag.

The treaty provides for an interchange of messages between the various systems of wireless telegraphy, of which there are now at least twenty in use. The formulating of the treaty was largely brought about by the refusal of ships equipped with one system to receive and transmit messages from ships and shore stations equipped with other systems. The Marconi Company contends that its patents would be infringed if the ships of all nations should exchange or forward messages regardless of the systems operating them, and is therefore opposed to such a treaty.

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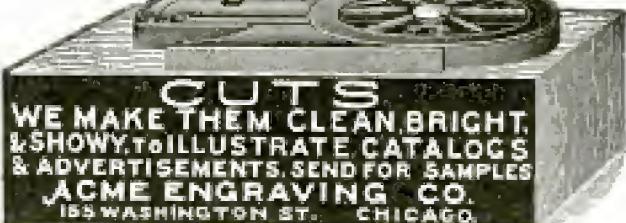
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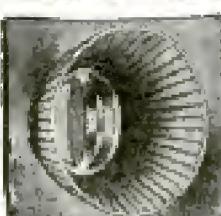


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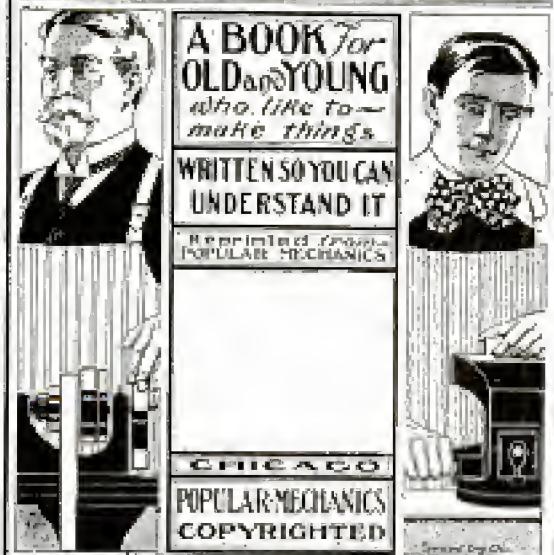


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NEXT FEW YEARS WILL ECLIPSE ALL AGES IN INVENTION.

By Edward B. Moore, Commissioner of Patents.

The age of invention has just begun to dawn. The accomplishments of the last half-century, while marvelous almost beyond conception, will not begin to compare with what will be done in the next half-century.

I base this conclusion upon a definite knowledge of what is being done at present and an appreciation of the great world scope that invention is assuming. There is no evidence of a waning of inventive genius, while greater stores of knowledge, better trained hands, and both these in vastly greater numbers, are being brought to bear in the field of invention.

The number of patents applied for and the number granted at the patent office last year were greater than at any time in its history. With the increased number there is no decrease in the individual importance, but merely an evidence of increased industrial activity that demands the articles patented.

There are periods of activity and depression along certain lines of industrial art. Some years ago we had ten men at work on bicycles alone, while now one man devotes but half his time to them. Eight men formerly worked on reapers, while they are so nearly perfected that but three are engaged.

This does not mean, however, that any line of machinery is ever made so perfect that no further inventions will follow, for there are as many patents issued today for the improvement of plows as at any time in the history of the world, and the plow in the form of a forked stick was among the first tools invented. There are, however, certain lines of great activity at present and in the near future.

Electricity offers an unlimited field, and the number of patents bearing upon it is without end, while the flying machine is but beginning to show its possibilities. Wireless telegraph and telephone are just being heard from, while at any time a great basic principle like that of the Bell telephone may be discovered that will open up new realms.

The inventor of today is a different man from the long-haired, erratic genius of a generation ago. He is in nearly all cases an inventor by profession, trained in the best technical schools and devoting his life to the creation of new things. He is, above all, a practical man of affairs.

The people of the United States have gained more than any other nation from their inventions. These have enabled them to enter the markets of the world and force out competition in many grades of machinery. The patent laws of this country have been a greater protection to the inventors than have those of any of the other nations and are being widely adopted.

Treaties for the protection of patents are being universally adopted. Such treaties are now being arranged by the state department with China and all the nations of South America. Japan is but just finding that her people have the same inventive mind that is shown in America.

The awakening of new minds and new nations is going to bring on renewed activity and competition, and nations will go forward at a still greater rate. World's fairs have done much to make this activity world wide, and the promise is that our children will live in a world that we would not recognize.—Chicago Journal.



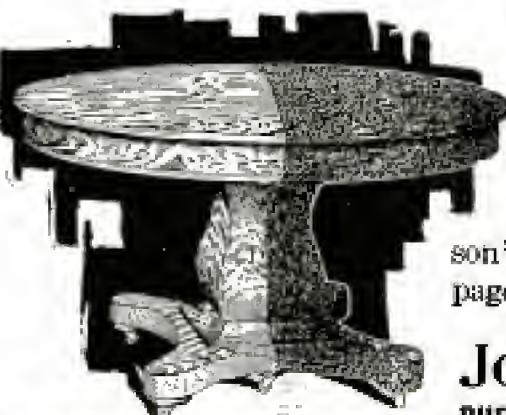
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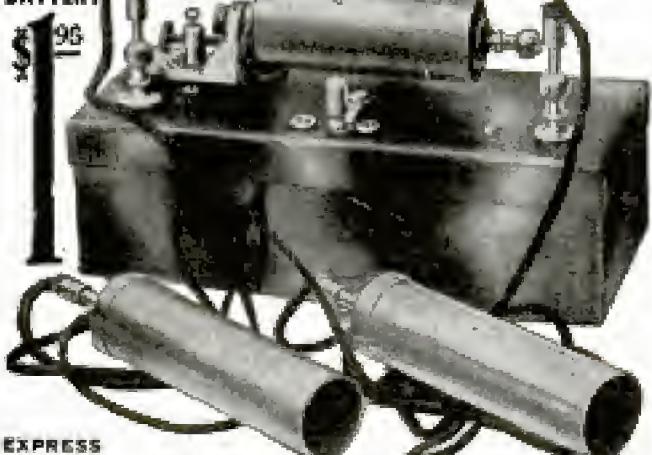
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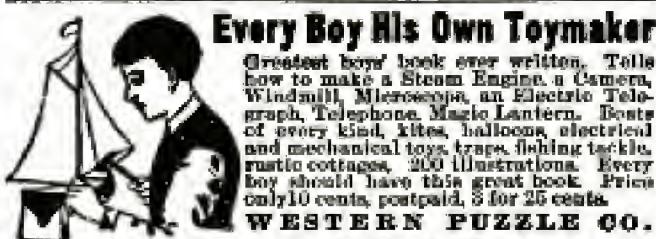
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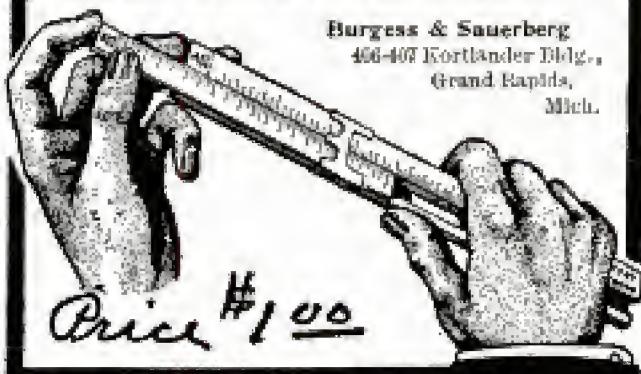
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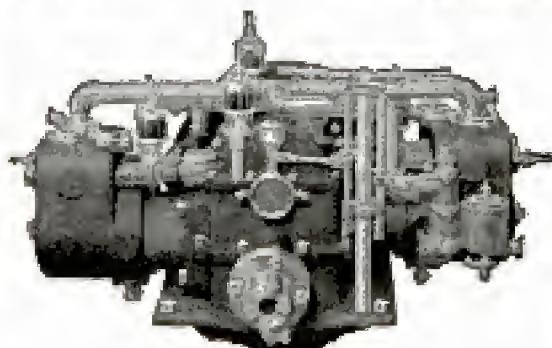
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A FLOATING CHURCH.—The Rev. Louis Ives, of England, who has taken charge of the Missions to Seamen at the port of Newcastle, New South Wales, has been provided with a steam vessel for his work in the harbor. With this vessel he will steam from ship to ship to preach sermons to the crews or minister in case of illness or trouble.

AUCTIONEERING BY PIN AND CANDLE.—The old custom of leasing land to the highest bidder by the aid of a candle and pin is still being observed at Vidmouth, a village between Reading and Newbury, England. The candle is lighted and a pin stuck into it. Bids are then called for until the pin, owing to the softening of the candle, drops out.

BURNED BANK NOTE A CURIO.—Among the curios preserved in the Bank of England is a bank note that passed through the Chicago fire. The paper was consumed but the ink held together, and the printing is quite legible. It is kept carefully under a glass. The bank paid the note.

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SECOND SECTION CLASSIFIED.

This is a continuation of the classified ads. For first section classified see pp. 21 to 25, inclusive.

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FORD RUNABOUT OWNERS—Don't swear any more; order one of our equinotaur outfitts; any one can put them on with our careful instructions. Your troubles are ended. Prices upon application. Good proposition for repairmen and garages. Write today. Auto Rebuilding Parts Co., 37 Franklin St., Newark, N. J.

FOR SALE, AUTO SUPPLIES—Magnets for Ford runabouts, with full instructions. No batteries. No trouble. Auto Rebuilding Parts Co., 37 Franklin St., Newark, N. J.

16 AUTOMOBILES—Second-hand, closed out at once; motor gears and parts. Send for bargain sheet prices; will surprise you. Write today. T. S. Culp, Canton, Ohio.

FOUR-CYLINDER light delivery truck, \$850; Stephans-Duryea 4-cylinder touring car, \$1,100; White Steamer, full equipment, \$850. Running gear complete with 30" wood wheels and 30x3" tires, \$45; Goodson magneto, \$12; Apple dynamo with governor, \$1.20; transmission gear suitable for 3 to 5 ton truck, \$25; about 50 other bargains in second-hand autos. Write for any make you want and save money. A. Trabold, Johnstown, Pa.

AUTOMOBILE BODY AND RUNNING GEAR for runabout, with top, lamps and horn; good as new, \$75. E. G. Ottmsted, New Philadelphia, Ohio.

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BRAND NEW Oliver or Williams typewriter and some cash for good motorcycle. Indian preferred. Give model, condition and difference wanted. Box 635, Lincoln, N. C.

FOR SALE—New Curtis 2-cylinder 5 hp. motor cycle engine, half price. Bates, 281 Oak St., Chicago.

FOR SALE—Two Indian motor cycles, with new G. & J. tires; late models and in fine condition. Write for particulars. Kenner Repair Company, New Midway, Md.

HIPKINS AUTOMATIC change speed pulley for motor cycles. Automatically reduces gear for hills and sand. Fits all motors. Drawings and prices, address Advance Sales Co., St. Paul, Minn.

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ELEVEN HONEST BUSINESS PLANS and trade secrets, including plating process. A chance to be "your own boss" and make from \$15 to \$75 weekly. Circumloc free. Ohio Enterprise Co., No. 280 W. Jefferson St., Springfield, Ohio.

I MADE \$70,000 in five years in the small order business; began with \$5. Anyone can do the work in spare time. Send for free booklet; tells how to get started. Manager, Box 570, Lockport, N. Y.

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FOR SALE—Mitchell Motorcycle, 13½-hp.; tires in good shape and the running condition guaranteed. Price, only \$50. Theo. H. Bell, 23 North Clay St., Coldwater, Mich.

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FOR SALE—Castings for 2-cylinder vertical motor, 54x60 crankshaft, fly wheel, cylinders and valves are finished, price \$40. Photo for six cents. H. A. Fisler, Marcus, Iowa.

FOR SALE—Launch patterns (Brooks), No. 7. Address 200, care Popular Mechanics.

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FOR SALE—Spanish language photographic enlarger complete, graphophone, records, and text books. Cost \$80. Price, \$25. R. T. Webster, 43 Triangle Building, Rochester, N. Y.

FOR SALE—Two hp. vertical steam engine, or will exchange for one hp. stationary gasoline engine. H. C. Thorsen, 2205 Fifth Ave., Terre Haute, Ind.

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FOR SALE—Two hp. upright engine and boiler, new tires in boiler, engine in good repair. Price, \$60. W. F. Lloyd, Sterling, Kan.

FOR SALE—Launch patterns (Brooks), No. 7. Address 200, care Popular Mechanics.

FOR SALE—One Fairbanks-Morse gas engine, 6 hp., \$175; one horizontal gasoline engine, 45x50, \$85; one Curtis, 12x12", power pipe machine, \$85; one 7" steam engine governor, \$80; one 4 to 2" hand pipe machine, \$25. Address Box 412, McConnellsburg, Ohio.

FOR SALE—New log, great feed saver. Will sell invention outright at once. Particulars. Address Harry Gerry, Hudson Heights, N. Y., Box 130.

FOR SALE—110 volt motor, ½ to ¼ hp. Dynamos, two to ten light, finished or parts only. F. E. Arell, 28 Verplanck St., Buffalo, N. Y.

FOR SALE—Warehouse, wheat elevator and coal business. Warehouse can be used for blacksmith shop. Will rent to right party. No shop here. Wm. H. Seifert, Cedar Rapids, Ind.

PATRIOTIC GAS ENGINE, 75c. 40-watt dynamo; some other bargains. Address Earl G. Asker, Cranbrook, Canada.

FOR SALE—½ hp. vertical steam engine, in good condition. Price, \$15. Also one 75-watt dynamo, in good condition. Price, \$10. Write for photo. Otto Johnson, Box 25, Springdale, Ark.

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WANTED—Second-hand marine steam engine and boiler, 2 or 3 hp. Jas. M. Ballantine, Hobart, Ind.

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MISCELLANEOUS

NEW IDEAS PROPERLY DEVELOPED bring greater wealth than any science, industry or profession. Read the advertisement headed "New Inventions" on page 120 of this magazine.

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MAKE that little steam engine now. Castings and all material for either marine or horizontal engine of 1-inch stroke and 1/4-inch bore, \$1.00. Working blueprints, 25c. O. N. Hansen, No. 183 Du Bois Ave., Elgin, Ill.

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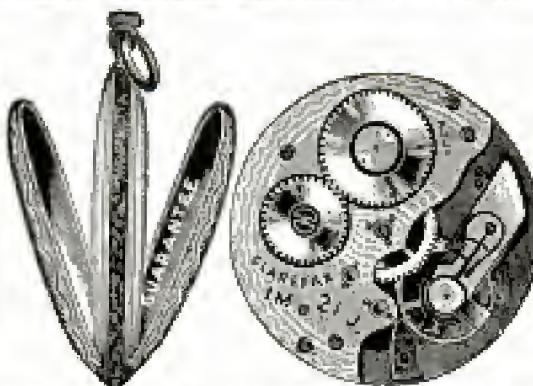
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A collage of various magazine covers and book jackets from the early 20th century, including titles like "Editor Popular Mechanics Magazine" and "Out on This Line". The collage features a variety of colors and fonts, with some text appearing in multiple locations across the different items.

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